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U.S. Department of the Interior  
Bureau of Land Management

Klamath Falls Resource Area  
2795 Anderson Ave., Bldg. 25  
Klamath Falls, Oregon 97603

March 1994



## Upper Klamath Basin Draft Resource Management Plan/ Environmental Impact Statement



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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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## United States Department of the Interior Bureau of Land Management

Klamath Falls Resource Area Office  
Lakeview District Office

March 1, 1994

Dear Reader:

You are cordially invited to assist the Bureau of Land Management (BLM) in a planning process that is important to you and your interests. We ask for your participation in evaluating this draft of the Upper Klamath Basin Resource Management Plan/Environmental Impact Statement (RMP/EIS) which has been prepared in conformance with land use planning procedures established by the Federal Land Policy and Management Act of 1976.

This Draft Resource Management Plan/Environmental Impact Statement (RMP/EIS) addresses resource management on approximately 3,200 acres of land acquired and administered by the Bureau of Land Management in the Klamath Falls Resource Area of the Lakeview District. This land, known as the Wood River property, is located in the upper Klamath Basin approximately 25 miles north of the city of Klamath Falls, in Klamath County, Oregon. Management objectives described in this RMP would be followed for other lands acquired by the BLM or returned to BLM-administration in the upper Klamath Basin.

There are four management alternatives, each with a different emphasis and each addressing the planning issues in a different way. The primary purpose for acquiring the Wood River property is to restore it to a functioning wetland community; therefore three of the alternatives (including the Preferred alternative) include various wetland restoration components, while the No Action Alternative (required by law) doesn't. Public comment played an important role in shaping both the issues and the alternatives that were analyzed in this document. Before the Preferred Alternative was developed, suggestions received from individuals, interest groups, and other government agencies were thoroughly considered. These suggestions were used to strike a reasonable balance between the diverse expressed desires of the public, considering relevant legal mandates. Many of the participants requested that we emphasize wetland restoration; others requested that we emphasize recreation uses; and still others desire that we protect and enhance natural values.

Through this draft RMP/EIS, the BLM has tentatively established resource management goals (as expressed by each alternative), resource management objectives, and specific management actions that would determine the potential land uses and areas in which use restrictions would apply.

The end product of this planning process will be a land use plan that will integrate the natural resources and their subsequent uses into a balanced, sustainable approach to multiple use management of the public lands, generally for the next 10 to 20 years. Your participation in this planning process is encouraged.

We would appreciate it if you would review this document and provide us with your written comments postmarked by May 31, 1994. Comments are most useful when they address one or more of the following:

- \* errors in the analysis that has been performed,
- \* new information that would have a bearing on the analysis,
- \* misinformation that may have been used, which could affect the outcome of the analysis,
- \* requests for clarification,
- \* support of an existing alternative, or
- \* definition of a substantive new alternative, considering the range of alternatives (that is, an alternative that would provide a different mix of allocations than any of the existing four alternatives).

BLM employees and members of the Wood River Wetland Team (an interagency/public team that assisted with RMP preparation) will be available at an informal public meeting, which will be held in late March or early April. Further details will be provided through the local media.

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For example, under alternative A some recreation use would be permitted. If you think that the level is too high and can show us how (such as citing studies or pointing our areas of resource damage), we would like to know that. To assist you in this comment process, you are invited to contact Cathy Humphrey, the planning team leader, in the Klamath Falls Resource Area office at any time during the comment period.

We welcome any information that will help us to best develop a management plan and analyze its anticipated effects. For example, although we have identified and quantified primary economic effects of the alternatives, we recognize that there are other effects on social values that are important, even though they are very difficult to describe or measure. Your comments may help us to better address these and other effects in the proposed RMP/ final EIS.

Thank you for your interest in the multiple use management of BLM-administered lands.

Sincerely,



Charles R. Graham  
District Manager  
Lakeview District

**U.S. Department of the Interior  
Bureau of Land Management**

**Draft  
Resource Management Plan/  
Environmental Impact Statement**

for the

**Upper Klamath Basin**

Prepared by the

Klamath Falls Resource Area of the  
Lakeview District  
March 1994



D. Dean Bibles  
State Director, Oregon/Washington



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Area Manager, Klamath Falls Resource Area



# Upper Klamath Basin Resource Management Plan and Environmental Impact Statement

Draft (X) Final ( )  
Department of the Interior  
Bureau of Land Management

1. Type of Action: Administrative (X) Legislative ( ).
2. Abstract: This Draft Resource Management Plan/Environmental Impact Statement (RMP/EIS) addresses resource management on approximately 3,200 acres of land acquired and administered by the Bureau of Land Management in the Klamath Falls Resource Area of the Lakeview District. This land, known as the Wood River property, is located in the upper Klamath Basin approximately 25 miles north of the city of Klamath Falls, in Klamath County, Oregon. Four alternatives, including the No Action alternative (continuation of existing management direction), are analyzed. These alternatives range from continuing current livestock grazing practices and economic values to restoration and management of wetlands. The main goal of the Preferred Alternative would be to restore the Wood River property to its previous form and function as a wetland community, within unalterable constraints (such as existing dikes, water rights, land ownership patterns, and funds). The Preferred Alternative would include both wetland restoration and stream restoration methods. The area would be declared an area of critical environmental concern and Special Recreation Management Area, and would be managed for moderate recreation use. Management objectives described in this RMP would be followed for other lands acquired by the BLM or returned to BLM-administration in the upper Klamath Basin.
3. The draft RMP/EIS will be made available in March 1994. The comment period will end on May 31, 1994. The draft EIS is not intended to fulfill any other environmental review or consultation requirements pursuant to 40 CFR 1502.25(a). Although several other agencies contributed to the draft EIS, the BLM is the sole preparing agency.
4. For further information contact:

Cathy Humphrey, RMP/EIS Team Leader  
Bureau of Land Management  
Klamath Falls Resource Area  
2795 Anderson Avenue, Bldg. 25  
Klamath Falls, OR 97603
5. The people responsible for preparing the RMP/EIS are A. Barron Bail, BLM Klamath Falls Resource Area manager and Charles R. Graham, BLM Lakeview District manager. The final decisions will be made by D. Dean Bibles, BLM Oregon/Washington State Director.



# User's Guide

This draft resource management plan/environmental impact statement (RMP/EIS) is divided into five chapters and several appendices, as well as other miscellaneous material, such as an Abstract, Summary, List of Acronyms, Glossary, and Bibliography. In addition, the Table of Contents includes a list of tables and maps for both the text and the appendices. This draft RMP/EIS contains the text, maps, and other miscellaneous materials needed to assist the public and decision maker in choosing a management direction for the Wood River property in the upper Klamath Basin. This User's Guide is to assist the reader in using the draft RMP/EIS.

The Summary presents a synopsis of the draft RMP/EIS. It summarizes all the alternatives, including more detail for the Preferred Alternative. Land use allocations for all issues are summarized. It also includes a summary of the environmental consequences and brief descriptions of monitoring, consistency with other government plans, and public involvement.

A list of Acronyms follows the Table of Contents, which follows this User's Guide, to assist the reader in reading the document. The list of Acronyms is placed at the front of the document to make it easier to find and use.

Chapter 1 is the Introduction to the draft RMP/EIS. This chapter includes a description of the planning area and the purpose and need for preparing the RMP/EIS. It also includes a discussion of the RMP's relationship to BLM policies, programs, and other plans and describes the planning process and planning criteria. Finally, it identifies the issues and concerns addressed in the RMP/EIS process.

Chapter 2 (Affected Environment) describes the existing environment that could be affected or changed by implementing any of the alternatives. The descriptions presented in this chapter are related to the issues identified in Chapter 1. This includes a description of the resource values, such as water resources, vegetation, wildlife habitat, visual resources, etc.

Chapter 3 (Description of the Alternatives including the Preferred Alternative) begins with a summary of the goals of each alternative, as well as the alternatives

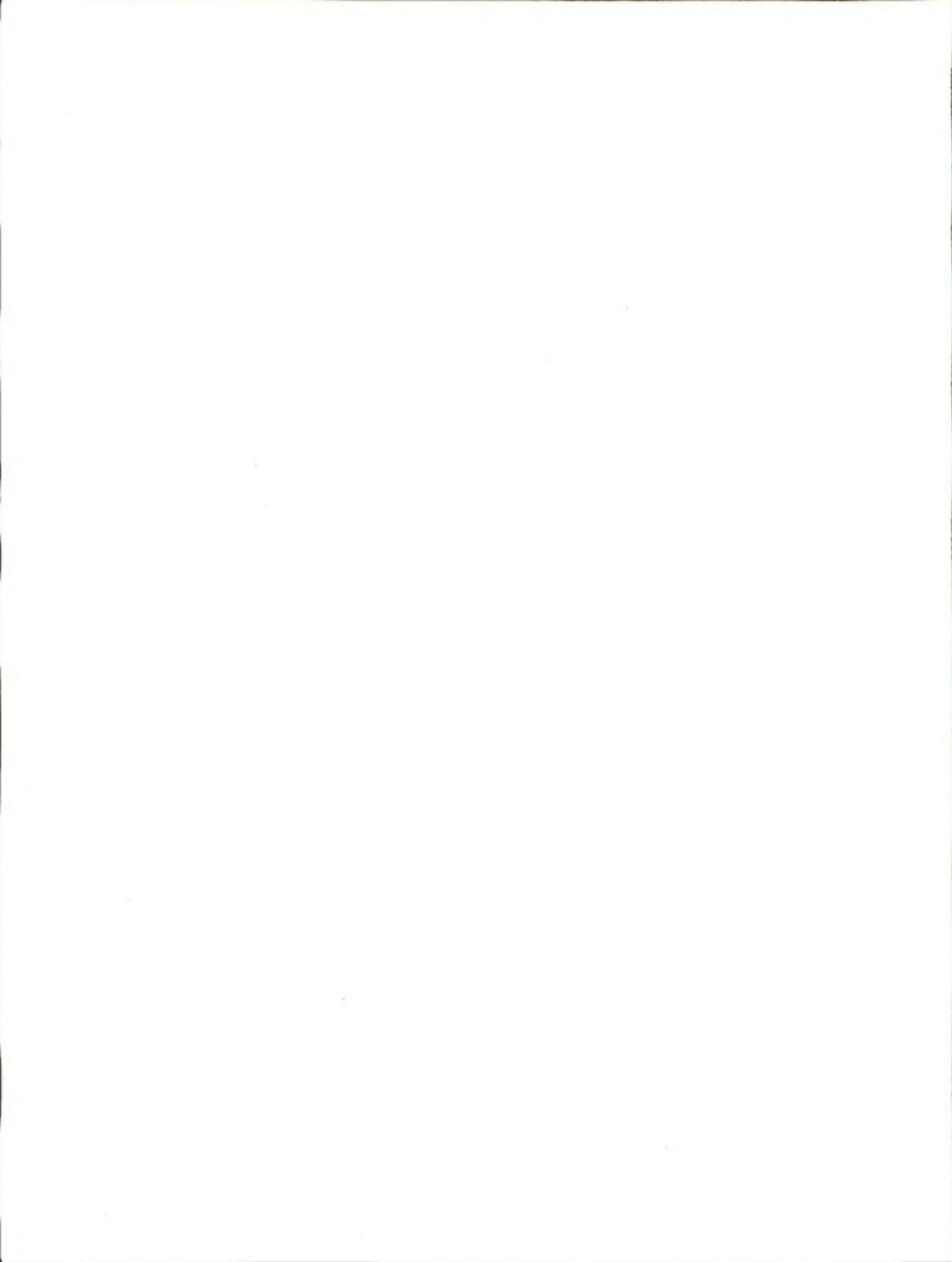
that were dropped from detailed study. The management direction is discussed for each alternative providing a mix of uses and actions that respond to, or resolve, the issues identified in Chapter 1.

Chapter 4 (Environmental Consequences) describes potential effects on the resources and land uses (or affected environment as described in Chapter 2) for each of the alternatives, if they were implemented. The chapter is organized by the effects on a particular resource and then a comparison of the alternatives.

Chapter 5 lists the agencies, organizations, and individuals that the BLM either contacted or received input from during the preparation of the draft RMP/EIS; and the agencies, organizations, and individuals that received a copy of the draft RMP/EIS. A list of the RMP/EIS team, other contributors, and the Wood River Wetland Team is also included in the chapter.

Appendices follow Chapter 5. Most of the appendices are fairly technical and are not necessarily meant for the general public, but rather to provide supporting documentation for specialists. Also included in the document are a list of tables and maps, Glossary, Bibliography, and Index to help the reader understand some of the more technical aspects of land management or just find their particular topic(s) of interest.

Further questions or information on this draft RMP/EIS can be answered or obtained at the Klamath Falls Resource Area office during regular business hours.



# Table of Contents

User's Guide .....	i
Acronyms .....	vii
Summary .....	S-1

## Chapter 1 - Introduction

Location .....	1-2
Purpose and Need for Action .....	1-2
Relationship to Other Documents .....	1-4
Consistency with State, Local, Tribal, and Other Federal Plans .....	1-4
Planning Process .....	1-4
Public Involvement .....	1-5
Wood River Wetland Team .....	1-5
Planning Criteria and Issues .....	1-5
Primary Issues and Effects Eliminated from Detailed Study .....	1-6
Decision Making .....	1-6
Monitoring the RMP .....	1-6
Research .....	1-7
Adaptive Management .....	1-7
Requirement for Further Environmental Analysis .....	1-7
Long-Term Management Goals and Objectives .....	1-8
Equalizing Tax Roles .....	1-8
Subsequent Chapters .....	1-9

## Chapter 2 - Affected Environment

Introduction .....	2-2
Climate .....	2-2
Topography and Geology .....	2-2
Valid Existing Rights .....	2-2
Air Quality .....	2-3
Water Resources .....	2-3
Water Rights .....	2-4
Wood River Ranch Water System Operations .....	2-4
Water Quality .....	2-5
Groundwater .....	2-7
Wetlands .....	2-7
Soil Resources .....	2-8
Ponded Histosols .....	2-8
Kirk-Chock Association .....	2-8
Lather Muck Association .....	2-8
Prime and Unique Farmlands .....	2-9
Vegetation .....	2-9
Pasture .....	2-9
Aquatic and Emergent Vegetation .....	2-9
Woody and Riparian Vegetation .....	2-9
Special Status Plants .....	2-9
Noxious Weeds .....	2-9
Livestock Grazing .....	2-9
Special Status Species Habitat .....	2-10
Special Status Wildlife Species .....	2-10
Special Status Fish Species .....	2-11
Special Status Plant Species .....	2-11

Wildlife Habitat .....	2-11
Pasture/Meadow Habitat .....	2-12
Aquatic and Emergent Vegetation/Wetland Area .....	2-12
Riparian .....	2-13
Open Water Habitat .....	2-13
Fish Habitat .....	2-13
Cultural Resources .....	2-14
Visual Resources .....	2-15
Recreation .....	2-16
Wild and Scenic Rivers .....	2-16
Mineral Resources .....	2-16
Socioeconomic Conditions.....	2-17

## **Chapter 3 - Management Alternatives**

Introduction .....	3-2
Alternatives Considered but Dropped from Further Analysis .....	3-2
Alternative A - No Action, Continuation of Existing Management Direction .....	3-3
Air Resources .....	3-3
Water Resources .....	3-3
Soil Resources .....	3-3
Visual Resources .....	3-3
Special Status Species Habitat .....	3-3
Fish and Wildlife Habitat .....	3-4
Recreation .....	3-4
Special Areas .....	3-4
Cultural Resources .....	3-4
Roads and Facilities .....	3-4
Mineral and Energy Resources .....	3-4
Livestock Grazing .....	3-6
Fire Management .....	3-7
Noxious Weed Management .....	3-7
Alternative B .....	3-7
Air Resources .....	3-7
Water Resources .....	3-7
Soil Resources .....	3-11
Visual Resources .....	3-11
Special Status Species Habitat .....	3-11
Fish and Wildlife Habitat .....	3-11
Recreation .....	3-12
Special Areas .....	3-12
Cultural Resources .....	3-12
Roads and Facilities .....	3-12
Mineral and Energy Resources .....	3-14
Livestock Grazing .....	3-14
Fire Management .....	3-14
Noxious Weed Management .....	3-14
Alternative C .....	3-14
Air Resources .....	3-15
Water Resources .....	3-15
Soil Resources .....	3-15
Visual Resources .....	3-15
Special Status Species Habitat .....	3-15
Fish and Wildlife Habitat .....	3-16
Recreation .....	3-16
Special Areas .....	3-18
Cultural Resources .....	3-18

Roads and Facilities .....	3-18
Mineral and Energy Resources .....	3-18
Livestock Grazing .....	3-18
Fire Management .....	3-18
Noxious Weed Management .....	3-19
Alternative D - The Preferred Alternative .....	3-19
Air Resources .....	3-19
Water Resources .....	3-19
Soil Resources .....	3-21
Visual Resources .....	3-21
Special Status Species Habitat .....	3-21
Fish and Wildlife Habitat .....	3-21
Recreation .....	3-22
Special Areas .....	3-22
Cultural Resources .....	3-24
Roads and Facilities .....	3-24
Mineral and Energy Resources .....	3-25
Livestock Grazing .....	3-25
Fire Management .....	3-25
Noxious Weed Management .....	3-25

## Chapter 4 - Environmental Consequences

Introduction .....	4-2
Assumptions Used in the Alternatives .....	4-2
Environmental Consequences .....	4-2
Effects on Air Quality .....	4-2
Effects on Water Resources .....	4-4
Effects on Wetlands .....	4-7
Effects on Soil Resources .....	4-9
Effects on Vegetation .....	4-9
Effects on Fish and Wildlife Habitat .....	4-13
Effects on Special Status Species Habitat .....	4-17
Effects on Recreation .....	4-17
Effects on Visual Resources .....	4-19
Effects on Cultural Resources .....	4-19
Effects on Livestock Grazing .....	4-20
Effects on Noxious Weed Management .....	4-21
Effects on Socioeconomic Conditions .....	4-21

## Chapter 5 - Consultation and Coordination

Introduction .....	5-2
Agencies, Organizations, and Individuals Contacted .....	5-2
Preparers .....	5-5

## Tables

Table 1 - Results of the 1988 Oregon DEQ Statewide Assessment of Nonpoint Sources of Water Pollution .....	2-6
Table 2 - Special Status Wildlife Species Known or Suspected in the Wood River Area .....	2-10
Table 3 - Fish Species in the Wood River Area .....	2-14
Table 4 - Cow-Yearling Operation, South-Central Oregon .....	2-17
Table 5 - Summary of Stream Channel and Wetland Restoration Options .....	3-8
Table 6 - Summary of Stream Channel and Wetland Restoration Options .....	4-3

## Maps

Map 1 - General Location .....	1-3
Map 2 - Wood River Wetland - Alternative A .....	3-5
Map 3 - Wood River Wetland - Alternative B .....	3-13
Map 4 - Wood River Wetland - Alternative C .....	3-17
Map 5 - Wood River Wetland - Alternative D .....	3-23

## Appendices

Appendix 1 - Plant Species on Wood River Property .....	Apx-1
Appendix 2 - Wildlife Species on Wood River Property .....	Apx-3
Appendix 3 - Wood River Wetland Plan Monitoring .....	Apx-7
Introduction .....	Apx-7
Air Quality .....	Apx-8
Soil Productivity .....	Apx-9
Water Resources .....	Apx-10
Riparian Zones .....	Apx-11
Wildlife Habitat .....	Apx-11
Fish Habitat .....	Apx-12
Special Status Species .....	Apx-13
Areas of Critical Environmental Concern (ACECs) .....	Apx-13
Visual Resources .....	Apx-14
Grazing Management .....	Apx-15
Appendix 4 - Wood River Potential Area of Environmental Concern Evaluation .....	Apx-17
Introduction .....	Apx-17
Relevance .....	Apx-17
Importance .....	Apx-20
Summary .....	Apx-21
Conclusion .....	Apx-21
Appendix 5 - Wild and Scenic River Eligibility Determinations .....	Apx-23
Summary .....	Apx-23
Purpose and Need .....	Apx-23
Steps to Evaluate a Potential River Segment .....	Apx-23
Eligibility Criteria .....	Apx-23
Further Consideration .....	Apx-24
Further Information .....	Apx-24
Appendix 6 - Water Resources, Wetland Functions .....	Apx-25
Introduction .....	Apx-25
Wetland Hydrology .....	Apx-25
Function of Wetlands in Relation to Water Quality .....	Apx-27
Appendix 7 - Stream and Wetland Restoration Options .....	Apx-31
Introduction .....	Apx-31
Stream Channel Restoration .....	Apx-31
Wetland Restoration .....	Apx-33
Glossary .....	Glossary-1
Bibliography .....	Bibliography-1
Index .....	Index-1

# Acronyms

ACEC	Area of Critical Environmental Concern
ALC	American Lands Conservancy
AMP	Allotment Management Plan
AQMA	Air Quality Management Area
AS	BLM Assessment
AUM	Animal Unit Month
BLM	Bureau of Land Management
BMP	Best Management Practices
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic feet per second
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FC	Federal Candidate (species)
FE	Federal Endangered
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act
FT	Federal Threatened
FY	Fiscal Year
GIS	Geographic Information System
IDT	Interdisciplinary Team
KFRA	Klamath Falls Resource Area
MG/L	Milligrams per liter
MOU	Memorandum of Understanding
NA	No Action (alternative)
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
NWSRA	National Wild and Scenic Rivers Act
OAR	Oregon Administrative Rules
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ONHP	Oregon Natural Heritage Program
ORS	Oregon Revised Statutes
ORV	Outstandingly Remarkable Values (for wild and scenic rivers)
OSMP	Oregon Smoke Management Plan
OSU	Oregon State University
OWRD	Oregon Water Resources Department
PA	Preferred Alternative
PM	Particulate Matter
PL	Public Law
PNC	Potential Natural Communities
PPM	Parts Per Million
RMA	Riparian Management Area
RMP	Resource Management Plan
ROD	Record of Decision

ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
SCS	Soil Conservation Service
SE	State Endangered (species)
SIP	State Implementation Plan
SRMA	Special Recreation Management Area
SS	State Sensitive (species)
ST	State Threatened (species)
TMDL	Total Maximum Daily Loads
USBR	U.S. Bureau of Reclamation
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
VRM	Visual Resource Management
WRWT	Wood River Wetland Team

# Upper Klamath Basin Resource Management Plan/ Environmental Impact Statement Summary

## Table of Contents

Introduction	S-2
Management Alternatives	S-2
Alternative A (No Action)	S-2
Alternative B	S-3
Alternative C	S-3
Alternative D (Preferred Alternative)	S-3
Resource-Specific Management	S-4
Objectives under Alternative D	
Monitoring The RMP	S-4
Consistency with State, Local, Tribal, and Other Federal Plans	S-5
Public & Interagency Involvement	S-5



# Introduction

The Upper Klamath Basin Resource Management Plan (RMP) will establish guidelines for the management of the BLM-administered land on the Wood River property of the upper Klamath Basin in the Klamath Falls Resource Area of the Lakeview District for approximately ten to twenty years. The Draft RMP/Environmental Impact Statement (EIS) has been prepared in accordance with the BLM planning regulations issued under authority of the Federal Land Policy and Management Act and written in accordance with the Council on Environmental Quality regulations issued under authority of the National Environmental Policy Act. An interagency team, called the Wood River Wetland Team, was formed by the BLM to assist with development of the RMP/EIS.

The planning area currently consists of approximately 3,220 acres of BLM-administered surface estate at the mouth of the Wood River. The Wood River property lies at the upper end of the Klamath Basin, approximately 25 miles north of the city of Klamath Falls, Oregon. The parcel is basically flat, with elevations ranging from approximately 4,138 to 4,140 feet above sea level on the main property's interior and approximately 4,135 to 4,150 feet across the entire parcel. It is bounded on the east by the Wood River and the Wood River Marsh, approximately 300 acres of permanently flooded marsh; on the west by Sevenmile Creek; on the north by a dike; and on the south by Agency Lake. The south end is diked to keep Agency Lake from flooding most of the parcel.

If other lands in the upper Klamath Basin were acquired by the BLM or returned to BLM administration, they would be managed consistent with the management objectives described in the Record of Decision for this RMP/EIS.

## Management Alternatives

Four alternatives were developed and fully considered to meet the purpose and need of managing the Wood River property, while addressing issues and concerns of the BLM, the public, and the interagency/public Wood River Wetland Team (WRWT). Issues identified in the public meetings and by the WRWT include fish and wildlife habitat (which species will the BLM manage for), special status species (what will be done

for endangered suckers), funding (where is funding for management of property and research projects coming from, and is it guaranteed for the long term), economics and land tenure (how will the tax roles be equalized), recreation opportunities (will the property be open to hunting and fishing, what type of recreation facilities will be provided), access (what level of public access will be allowed), water resources (what will happen with water rights, how will water quality be improved), wetland restoration (what habitat types will be emphasized, how and when will the restoration occur), livestock grazing (will it still be allowed and if so, how much), and public involvement (what level of public involvement will occur).

Each alternative offers a possible course of action that, if selected, would provide guidelines for future, more specific management decisions. Site-specific management actions would be guided by the principles described in the final plan.

The four management alternatives that were analyzed are described, starting with the alternative's objective and a summary paragraph. The Preferred Alternative discussion includes the management objective for each resource.

The four alternatives are: Alternative A, the No Action Alternative, which is a continuation of current BLM management from the time of purchase; Alternative B, which is a wetland restoration alternative that generally employs fairly simple methods that are low technology; Alternative C, which is a wetland restoration alternative that generally employs more structured and engineered technology; and Alternative D, the Preferred Alternative as developed by the BLM and the WRWT, which is a combination of the other three alternatives. Management actions in these alternatives would be on BLM-administered lands and would not adversely affect adjacent landowners. Management alternatives (except Alternative A) were developed to meet the long-term goals and objectives for the Wood River property.

See Table S-1 at the end of the Summary for a brief comparison of the alternatives. Table S-2, at the end of the Summary, briefly compares the effects of the alternative management actions on the various resources.

### Alternative A (No Action)

Alternative A, referred to as the No Action Alternative, can be better described as a continuation of current management direction from the time of the BLM's purchase of the Wood River property. Some actions

are different than those occurring when the property was in private ownership because of laws, policies, and manuals that the BLM must follow when managing federal land; however, except for some minor resource protection measures, the No Action Alternative is basically the same as what would have occurred under private ownership. This alternative should not be misinterpreted to be an alternative where the BLM does no active management.

**Objective:** To maintain the current use of the property as predominantly for livestock grazing in an irrigated pasture.

Current management direction on the Wood River property would be continued. Livestock grazing would remain at current levels, which is up to 1,300 head/pairs of cattle each year (up to a maximum of 7,200 animal unit months). Water would be pumped off in the spring at current schedules. The amounts of upland, wet meadow, and marsh habitat would remain constant. Recreation resources would be managed for minimum use levels. The property would be closed to unauthorized motorized vehicle use.

## Alternative B

**Objective:** To restore the Wood River property to a functioning wetland with diverse plant communities and healthy, productive vegetation.

The majority of the Wood River property would be restored to a functioning wetland consistent with the long-term goals. Under this alternative, initial management actions could require highly engineered techniques, such as restoring the Wood River and Seven-mile Creek to their historic meandering channels; however, in the long-term, wetland restoration systems and methods would be designed for minimum maintenance using the existing landscape features (such as topography) and natural energies (such as stream flows) of the property. Vegetation management (including water level fluctuations, livestock grazing, fire, and mechanical manipulation) would be used to develop diversity in plant communities and to maintain healthy and productive vegetation. The amounts of upland habitat would decrease, while wetland habitat, such as wet meadows and marshes would increase. Recreation resources would be managed for moderate use levels.

## Alternative C

**Objective:** To restore the Wood River property to a functioning wetland with diverse plant communities and healthy, productive vegetation.

The majority of the Wood River property would be restored to a functioning wetland consistent with the long-term goals. Under this alternative, both initial and long-term wetland restoration could involve highly engineered techniques, complex designs, experimental methods, and/or pilot projects. The intent of these systems would be to improve water quality entering Agency Lake. When a system was developed with acceptable performance, the entire parcel could be converted to that system design. Research would figure more prominently in this alternative, and would encompass both the methods used for wetland restoration and the effects that restoration had on water quality and quantity, fish and wildlife habitat, and other relevant parameters. Vegetation management (including water level and flow fluctuations, livestock grazing, fire, and chemical and mechanical manipulation) would be used to develop desired plant communities. Shallow water wetland habitat would be emphasized. Recreation resources would be managed for high use levels, and would emphasize education and interpretation.

## Alternative D (Preferred Alternative)

**Objective:** To restore the Wood River property to its previous form and function of a wetland community, within unalterable constraints (such as existing dikes, water rights, land ownership patterns, and funds).

Long-term improvements in water quality entering Agency Lake would be a goal; however, localized decreases in water quality could occur in the short term. Improving and increasing wetland habitat for federally listed suckers and for waterfowl would be emphasized. Labor-intensive, highly engineered wetland restoration methods using complex designs would be allowed; however, the preference would be to use wetland restoration systems and methods that were designed with less labor-intensive practices using the existing landscape features (such as topography) and natural energies (such as stream flows) of the property. Pilot studies would be allowed. Adaptive management, the process of changing land management as a result of monitoring or research, would be used. Recreation resources would be managed for moderate use levels.

### Resource-Specific Management Objectives under Alternative D

Management objectives for each resource or program and the management actions to achieve these objectives are described in Chapter 3. The resource/program objectives are repeated here:

## **Summary**

**Water Resources:** To improve the quality and quantity of water entering Agency Lake.

**Stream Channel Restoration:** To restore Wood River and Sevenmile Creek to approximate their historic meandering flow patterns prior to channelizing and dredging. This restoration would only occur within BLM-administered lands, would be consistent with Oregon State water laws, and would not adversely affect water use or rights of other landowners.

**Wetland Restoration:** To restore the majority of the Wood River property to a functioning wetland community, including restoration of the historic vegetation community.

**Soil Resources:** To ensure that undue degradation of soils would not occur.

**Visual Resources:** To ensure management actions meet Visual Resource Management Class II objectives.

**Special Status Species Habitat:** To protect habitats of federally listed or proposed threatened or endangered species; to avoid contributing to the need to list category 1 and 2 federal candidate, state listed, and Bureau sensitive species; to emphasize management of special status species, including a complete inventory; and to maintain a diversity of habitats to meet or exceed viable population levels.

**Fish and Wildlife Habitat:** To improve spawning and rearing habitat conditions for suckers and salmonids; to improve habitat for raptors and neotropical migratory birds; and to optimize waterfowl habitat within the constraints of other resource objectives.

**Recreation:** To provide opportunities for roaded natural recreation experiences (opportunities to have a high degree of interaction with the natural environment); to manage the area for low to moderate recreation use levels (moderate near developed sites and roads, and low to moderate in other areas) and for day use only; and to designate the area as the Wood River Special Recreation Management Area (SRMA).

**Special Areas:** To manage the area as an Area of Critical Environmental Concern; and to protect the area's relevant and important values, which are cultural, fish, and wildlife values, and its natural processes and systems.

**Cultural Resources:** To protect known cultural resources (including both historic and prehistoric resources).

**Roads and Facilities:** To provide adequate roads and facilities (quality and quantity) to support management objectives.

**Mineral Resources:** To pursue acquisition of mineral estate, if the opportunity arises, and to ensure mineral activity does not conflict with other management goals. If the mineral estate remains in private ownership, the objective would be to work with the private owner to prevent mineral activity from conflicting with other management goals, to the extent possible.

**Livestock Grazing:** To use livestock grazing as a management tool to support the primary goal of wetland restoration, if and where appropriate.

**Fire Management:** To suppress all wildfires, and to reintroduce fire as an ecosystem process by using prescribed burning as a management tool to support the primary goal of wetland restoration.

**Noxious Weed Management:** To manage noxious weed species to facilitate restoration and maintenance of desirable plant communities and healthy watersheds; to prevent introduction, reproduction, and spread of noxious weeds into and within the resource area; and to manage existing populations of noxious weeds to levels that minimize the negative impacts of noxious weed invasions.

## **Monitoring The RMP**

Monitoring and evaluation of the resource management plan would be carried out at appropriate intervals for the following purposes:

- \* To be sure activities are occurring in conformance with the plan.
- \* To determine if activities are producing the expected results.
- \* To determine if activities are causing the effects identified in the environmental impact statement.

See Appendix 3 for more information.

# Consistency with State, Local, Tribal, and Other Federal Plans

BLM planning regulations require that resource management plans be consistent with officially approved or adopted resource-related plans, and the policies and procedures therein, of federal agencies, state and local governments, and Indian tribes, so long as the RMPs are also consistent with applicable federal laws and regulations. The BLM has compared the Preferred alternative of this draft RMP with plans from other agencies. This alternative appears to be consistent with all such plans, policies, and procedures.

## Public and Interagency Involvement

The Wood River acquisition was initiated by the public and the Klamath Basin Water Resources Advisory Committee, who solicited the Congress in the fall of 1992 to appropriate funding for the BLM to purchase the property. Since then, public involvement has been an integral part of the Wood River planning process.

The BLM held scoping meetings in January 1993 and meetings of an interagency team (including members of the public) have been held monthly since May 1993. The US Fish and Wildlife Service, Bureau of Reclamation, Klamath Tribe, Oregon Department of Fish and Wildlife, and Oregon Department of Water Resources are cooperating agencies in the preparation of this RMP/EIS.

To date, public involvement has included information mailers, public meetings, field trips, distribution of planning documents, document review and comment periods, informal contacts and group meetings, as well as the development of the Wood River Wetland Team (discussed further in a later paragraph). Comment letters and other input received since the scoping began, have been considered while preparing the alternatives.

In the spring of 1993, the BLM formed an interdisciplinary interagency team, called the Wood River Wetland Team (WRWT), to assist with planning for and management of the Wood River property. Team members include federal, state, and local government agencies; the Klamath Tribe; interest groups; neighboring landowners; and other interested individuals.

The WRWT reviewed the Affected Environment and Environmental Consequences, and assisted with development of management alternatives, including the Preferred Alternative. They will assist in reviewing the comment letters on this draft EIS, and in development of the final EIS based on those comments. The WRWT will be reviewing all proposed projects to ensure they are consistent with management goals for the property.

The draft RMP/EIS has been released for public review and comment until May 31, 1994 for incorporation into the proposed RMP/final EIS. After comments are received, they will be evaluated. Substantive recommendations may lead to changes in the analysis of environmental consequences or to one or more of the RMP alternatives. The proposed RMP/final EIS is expected to be completed for public review by late 1994. Any protests on that document will be reviewed and addressed by the Director of the BLM before a Record of Decision on the RMP is approved and published.

**Table S-1. Summary of Management Actions**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Air Resources	Monitor air quality to meet goals of the Federal Clean Air Act, Oregon Implementation Plan, and Oregon Smoke Management Plan.	Same as A.	Same as A.	Same as A.
Water Resources	Restrict grazing in riparian areas and Wood River Marsh.	Same as A.	Same as A.	Same as A.
	Continue current irrigation system	Restore property to wetlands opting for low maintenance methods when feasible.	Maximize treatment of water quality with engineered projects.	Same as B.
	Continue periodic dredging of Wood River.	Improve water quality entering Agency lake through passive filtration.	Improve water quality entering Agency lake through engineered systems/pilot projects.	Improve water quality entering Agency Lake through changes in current management practices and passive filtration.
	Complete current water quality studies.	Use current irrigation system to manipulate wetlands.	Choose most effective pilot projects for long-term implementation.	Use or modify current irrigation system to manipulate water levels/soil moisture conditions to maintain a functioning wetland.
				Cooperate in studies to determine effectiveness of wetland systems in improving water quality and storage.

**Table S-1. Summary of Management Actions**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Stream Channel Restoration	None	<p>Restore Wood River's meandering flow in the Wood River Marsh.</p> <p>Restore wetland by establishing meandering flow for Sevenmile Creek through main property.</p> <p>Restore wetland by establishing meandering flow for Wood River through main property.</p>	Same as B.	Same as B.
Wetland Restoration	None	<p>Restore wetland by operating the existing canal and pump system (Option 1).</p> <p>Restore wetland by re-establishing the lake/wetland interface (opening the property to prevailing water levels in Agency Lake) (Option 2).</p> <p>Restore wetland supported by inflows from Sevenmile Creek (no pre-defined path) and outflow to Agency Lake (Option 3).</p> <p>Restore wetland supported by inflows from Wood River (no pre-defined path) and outflow to Agency Lake (Option 4).</p>	Same as B	Same as B
			Construct and operate small pilot study areas to refine design details and operating procedures to proceed with wetland restoration (Option 5).	Establish a wetland system/water quality treatment system designed to provide specific characteristics that enhance water treatment performance (Option 6).

**Table S-1. Summary of Management Actions**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Soil Resources	Design management actions to mitigate soil degradation.	Design and monitor management actions to ensure that undue degradation of soils would not occur.	Same as B.	Same as B.
Visual Resources	Meet VRM Class IV objectives.	Meet VRM Class II objectives.	Meet VRM Class III objectives	Same as B
Special Status Species	Survey for suspected special status species. If found protect by modifying or dropping the proposed activity and/or consulting with USFWS.	Same as A. In addition place structures in and along stream and creek banks for suckers.	Same as B. In addition create or enhance other habitat. Install telephone perches for bald eagles.	Same as B.
Fish & Wildlife Habitat	Provide a healthy pasture/meadow habitat.	Provide wetland habitat.	Same as B. In addition create or improve other habitat depending on water levels available.	Same as B.
		Plant trees for habitat needs and dike stability.	Same as B.	Same as B.
		Use some vegetation management, such as prescribed fire, livestock grazing, water fluctuations, to create habitat diversity.	Same as B.	Same as B.

**Table S-1. Summary of Management Actions**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Fish & Wildlife Habitat (Continued)		Re-create meanders in Wood River and/or Sevenmile Creek for fish habitat.  Place large woody structures along river/creek banks.	Same as B.  Same as B.	Same as B.  Develop nest islands and/or upland areas for waterfowl nesting.
Recreation Resources	Close to motorized vehicles.  Provide minimal recreation facilities for resource protection.  Provide non-motorized recreation experience opportunity.	Limit motorized vehicles to designated roads.  Develop some recreation facilities (parking, trails).  Provide roaded natural recreation experience opportunity.	Limit motorized vehicles to east, west, and south dike roads.  Develop maximum recreation facilities (parking, trails).  Provide rural recreation experience opportunity.	Limit motorized vehicles to designated, signed roads.  Develop some to moderate recreation facilities (parking, trails).  Same as B.
		Coordinate hunting and fishing with ODFW. No shooting in safety zones.  Identify as Watchable Wildlife site.	Coordinate hunting and fishing with ODFW; most restrictive. No shooting in safety zones.  Same as B.	Monitor and coordinate hunting and fishing with ODFW based on results of monitoring data.  Designate as special recreation management area and identify as a Watchable Wildlife site.

**Table S-1. Summary of Management Actions**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Special Areas	Do not designate as an ACEC.	Designate as an ACEC.	Same as B.	Same as B.
Cultural Resources	Conduct class I inventory. Prior to any surface disturbing activities conduct class III survey of site.	Same as A.	Same as A.	Same as A.
Roads and Facilities	Recognize existing ROWs.  Property remains closed to motor vehicles.	Same as A.  Motorized vehicles limited to improved roads (south).	Same as A.  Motorized vehicles limited to improved roads (south, east, and west).	Same as A.  Motorized vehicles limited to designated, signed roads.
	Maintain dike roads	Same as A. Improve south dike road.	Same as A. Improve roads (south, east, and west).	Same as A. Improve south and parts of west dike roads.
	Maintain existing facilities to sustain current livestock operations.	Remove some existing facilities, although pumps and pumphouse could be maintained.	Same as B.	Same as B.
Mineral Resources	No surface occupancy for mineral and energy leases.  Withdraw (close) to locatable mineral entry if mineral estate acquired in the future.	Same as A.	Same as A.	Same as A. Work with the private mineral estate owner to prevent mineral activity from conflicting with other management goals.

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**Table S-1. Summary of Management Actions**

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Resource	Alternative A	Alternative B	Alternative C	Alternative D
Livestock Grazing	<p>Continue existing grazing practices. Restrict grazing in riparian areas and Wood River Marsh.</p> <p>Develop allotment management plan.</p>	Use livestock grazing as management tool to support the primary goal of wetland restoration.	Same as B.	Same as B.
Fire Management	Establish initial attack agreement with Winema NF, USFWS, and/or ODF.	Same as A. In addition, use prescribed fire as tool to achieve management objectives.	Same as B.	Same as B.
Noxious Weeds	Follow integrated noxious weed management program and EA.	Same as A.	Same as A.	Same as A.

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**Table S-2. Summary of Effects**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Air Quality	No significant long-term effects.	Same as A.	Same as A.	Same as A.
Effects on Water Resources	<p>Water quality would continue to deteriorate from sediment input and nutrient loading.</p> <p>Sedimentation and fecal pollution from livestock would continue to degrade water quality.</p> <p>Insignificant effects (sedimentation) from recreation activities.</p> <p>Increase in water storage would not be realized.</p>	<p>Modest improvement in water quality.</p> <p>Significant decrease in livestock-related impacts on water quality compared to A.</p> <p>Minor effects from recreation activities.</p> <p>Greatest increase in water storage and net decrease in water use from creation of wetlands is possible.</p>	<p>Greatest improvement in water quality.</p> <p>Same as B.</p> <p>Greatest effects from recreation activities.</p> <p>Moderate increase in water storage and net decrease in water use is possible.</p>	<p>Slightly less water quality improvement than under B.</p> <p>Same as B.</p> <p>Effects from recreation activities would be greater than B and less than C.</p> <p>Same as C.</p>
Stream Channel Restoration	Wood River and Sevenmile Creek would remain channelized and sedimentation would continue. Continued dredging would negatively affect channel and riparian function.	Short-term sedimentation and nutrient impacts from stream channel restoration options.	Same as B, except less severe impact because less area would be disturbed.	Same as B.

**Table S-2. Summary of Effects**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Stream Channel Restoration (Continued)	Groundwater recharge and flood flow retention would remain the same.	Groundwater recharge and flood flow retention would improve.	Same as B, except to a lesser extent.	Same as B.
Wetland Restoration	Benefits from wetland restoration would not be realized.  Amount of shallow water wetland habitat would remain constant.	Short-term nutrient reduction would occur.  Moderate increase in shallow water wetland habitat (compared to A).	Same as B.  Greatest increase in shallow water wetland habitat.	Same as B.  Moderate increase in shallow water wetland habitat (less than under B).
Effects on Wetland Vegetation	Proportion of wetland and upland vegetation would remain constant.  Main property's interior would remain dominated by pasture grasses, annual forbs, and weedy species.	There would be an increase in the abundance and diversity of native wetland species, and a decrease in the levels of introduced and native upland species.	Greatest diversity in wetland vegetation.	Greater diversity in wetland vegetation than under A, but less than under B.
Effects on Soils	Soil would continue to subside and leach organics and nutrients into Agency Lake causing long-term decrease in soil productivity.	Soil productivity would increase compared to A.	Same as B.	Same as B.

**Table S-2. Summary of Effects**

Resource	Alternative A	Alternative B	Alternative C	Alternative D
Effects on Recreation Resources (Continued)	No speed restrictions would be sought for boats, so the least adverse effects on boaters would occur under this alternative.	Creation of meanders in Wood River would affect boaters by decreasing their speed and increasing the length of river to boats. Speed and wake limits could be imposed.	Same as B. Speed and wake limits would not be imposed.	Same as B.
Effects on Visual Resources	Visual resources would remain highly modified, and would not improve.	Greatest level of long-term improvement to visual resources. Moderate levels of short-term adverse effects on visual resources from restoration activities.	Moderate level of long-term improvement to visual resources. Greatest level of short-term adverse effects from restoration activities.	Same as B, except short-term adverse effects would be less significant.
Effects on Cultural Resources	Least potential negative effect on cultural resources.	Moderate potential negative effect on cultural resources resulting from proposed projects.	Highest potential negative effect on cultural resources resulting from proposed projects.	Same as B.
		Discovery of new sites would enhance knowledge base of regional cultural resources.	Same as B, but potential for discovery would be greater.	Same as B.
Effects on Livestock Grazing	BLM grazing administrative workloads would increase compared to the pre-acquisition workload.	BLM grazing administrative workload would not be significantly affected.	Same as B.	Same as B.

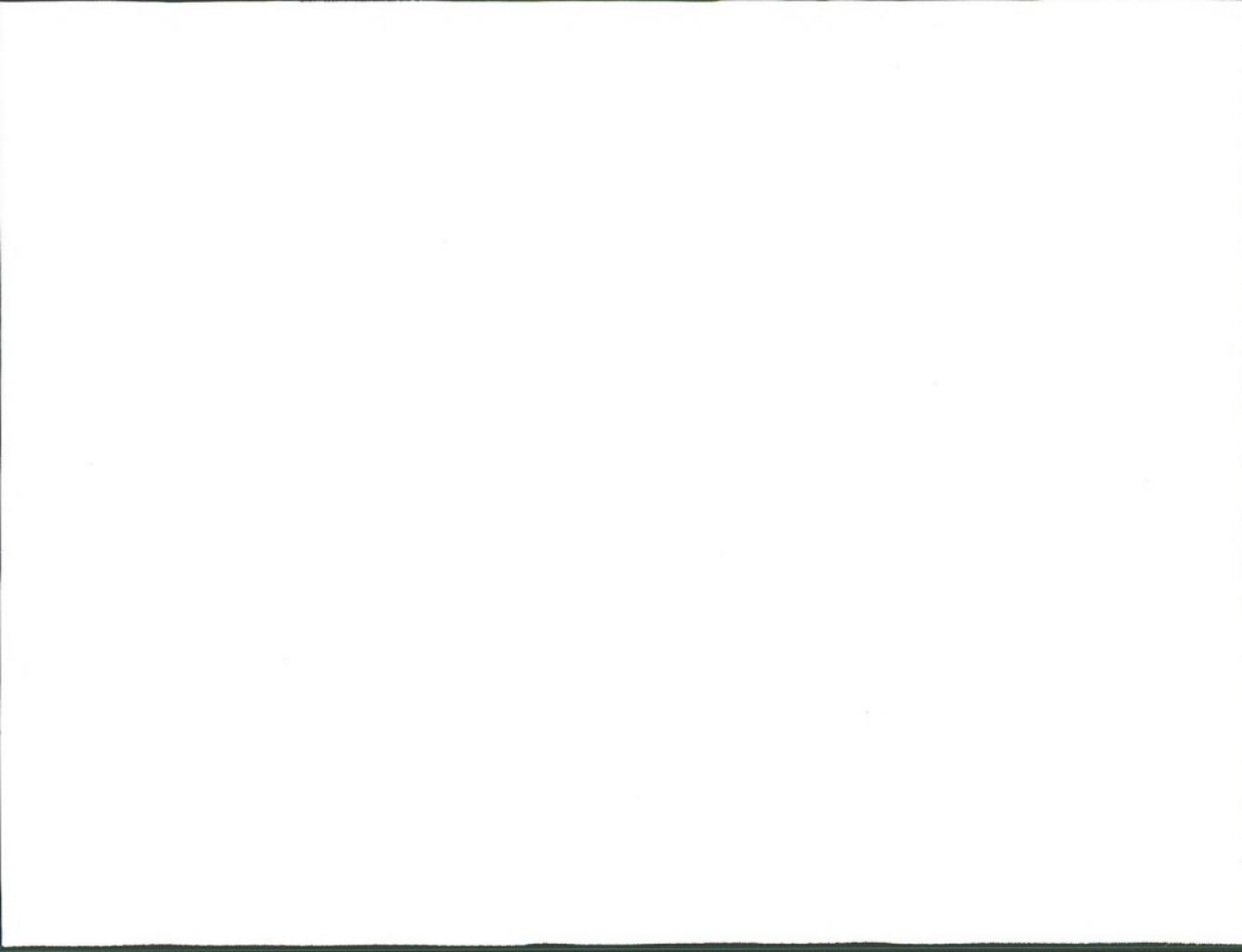
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**Table S-2. Summary of Effects**

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Resource	Alternative A	Alternative B	Alternative C	Alternative D
Effects on Livestock Grazing (Continued)	Continuation of the current situation would have a positive effect on revenues to the government and livestock producers compared to pre-acquisition revenues.	There would be a decrease in revenue to the government and livestock producers from a reduction in current livestock grazing levels.	Same as B.	Same as B.
Effects on Socioeconomics	The level of grazing use would generate approximately \$188,000 of gross agricultural sales, supporting three jobs and \$38,900 of personal income in the local economy.  The payment in lieu of taxes to the County would be \$322.	Termination of the ranching operation would result in a loss of \$180,000 in gross agricultural sales, three jobs, and \$38,900 in personal income.  Same as A.	Same as B.  Same as A.	Same as B.  Same as A.

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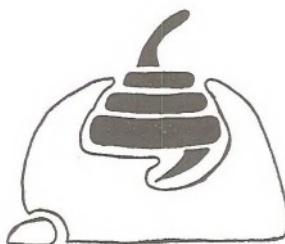


# Chapter 1

## Introduction

### Table of Contents

Location	1-2
Purpose and Need for Action	1-2
Relationship to Other Documents	1-4
Consistency with State, Local, Tribal, and Other Federal Plans	1-4
Planning Process	1-4
Public Involvement	1-5
Wood River Wetland Team	1-5
Planning Criteria and Issues	1-5
Primary Issues and Effects Eliminated from Detailed Study	1-6
Decision Making	1-6
Monitoring the RMP	1-6
Research	1-7
Adaptive Management	1-7
Requirement for Further Environmental Analysis	1-7
Long-Term Management Goals and Objectives	1-8
Equalizing Tax Roles	1-8
Subsequent Chapters	1-9



# Location

The Wood River property is part of the upper Klamath Basin. The upper Klamath Basin encompasses approximately 4,630 square miles in northern California and southern Oregon (Klamath County) (Klamath Basin Water Users Protective Association 1993).

Upper Klamath and Agency lakes; and Williamson, Sprague, Lost, and Klamath rivers are the major hydrologic features in the basin. Agricultural practices include row and field crops and cattle grazing. Most aspects of the principal water management issues for the upper Klamath Basin, including legal rights to the use of water in the basin, are addressed in the Bureau of Reclamation's Biological Assessment for the Long-Term Operation of the Klamath Project (USBR 1992).

The Wood River property is approximately 3,220 acres, located almost 25 miles north of Klamath Falls, Oregon (see Map 1) and approximately 15 miles from the nearest BLM-administered land within the Klamath Falls Resource Area. It is bounded on the south by Agency Lake, on the east by the Wood River and associated marsh, on the north-northwest by a dike, and on the west by the Sevenmile Creek. The property is divided east to west by a canal (see Map 2 in Chapter 3). The halves are referred to in this document as the north half and the south half. Approximately 280 acres are flooded marsh, 380 acres are upland habitat, and the remainder of the property is flood-irrigated pasture which was converted from the lake shore and delta by diking. Further description of the property can be found in Chapter 2, the Affected Environment.

# Purpose and Need for Action

Over the last two decades wetlands have become widely recognized as an important component of the ecosystem for their role in improving water quality, reducing flooding, providing important fish and wildlife habitat, groundwater recharge, and many other important functions. Yet annual net wetland losses in the U.S. during the 1980s totaled more than 2.6 million acres (Frayer 1991). Wetland restoration techniques are being explored in an attempt to reverse this trend.

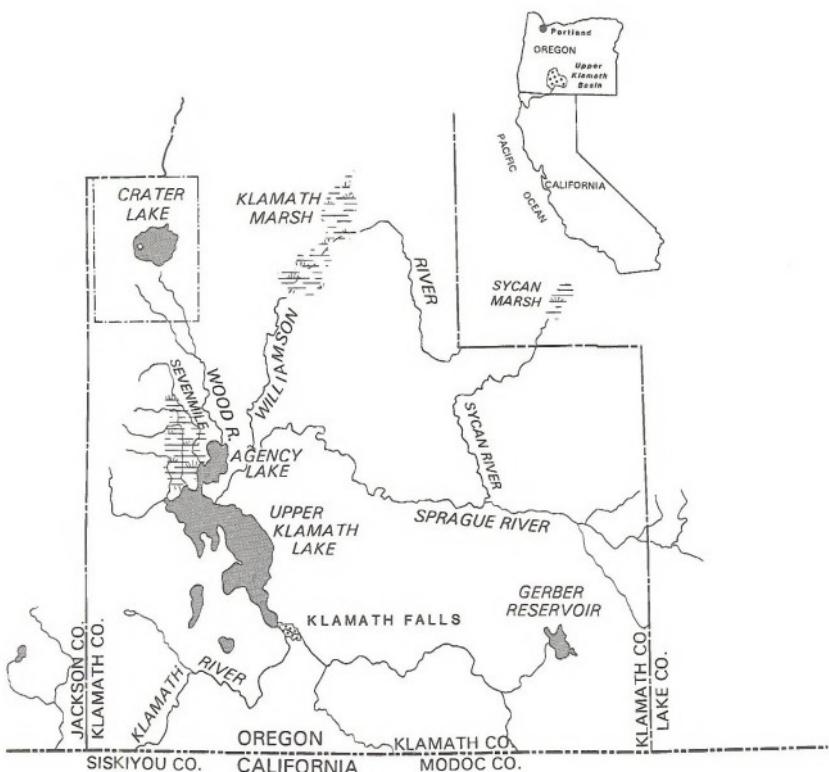
In the Klamath Basin, wetlands have been reduced from over 350,000 acres prior to 1905 to less than 75,000 acres today due to agricultural conversion, urbanization, and other human-induced changes to the

landscape (USBR 1992). See Chapter 2, Water Quality section for more information on wetland losses in the upper Klamath Basin. In an attempt to reverse this trend, the Klamath Basin Water Resources Advisory Committee solicited the Congress to appropriate funds to purchase the Wood River property for the purpose of wetland restoration.

In September 1992, the Congress appropriated \$1.3 million for the Bureau of Land Management (BLM) to purchase the Wood River property. The entire property was appraised at \$2.04 million. To facilitate the purchase, the American Lands Conservancy purchased the property until the BLM was able to complete the purchase. In July 1993, the BLM completed purchase of the south half of the property, and is currently pursuing acquisition of the north half through exchange or additional appropriation from the Congress. This environmental impact statement (EIS) analysis area covers the entire parcel anticipating final purchase of the north half in fiscal year 1994. Although additional acquisitions in the Wood River area are not anticipated at this time, the EIS provides an overview of land, water, and related resources in the upper Klamath Basin and could be used to guide management of additional acquired lands, if any.

In the Congressional appropriation, the BLM was directed to "consult with the Bureau of Reclamation and U.S. Fish and Wildlife Service with regard to common management issues affecting the Klamath Basin, and to dispose of appropriate land in Klamath County to compensate for tax revenue loss" (see discussion later in Chapter 1). Although no management guidance was specified, discussions with the Bureau of Reclamation, U.S. Fish and Wildlife Service, Klamath County Commissioners, Klamath Basin Water Resources Advisory Committee, and others, agreed that the intent of the purchase was to restore the property to a wetland.

Because restoration of the property to wetlands could significantly affect the natural and human environment (such as improving water quality), it was determined that an environmental impact statement was needed. This resource management plan/environmental impact statement (RMP/EIS) proposes several methods (alternatives) and examines the associated impacts whereby the wetlands conversion could be completed. The goal statement, developed for management and restoration of the property, is discussed in the Long-Term Management Goals and Objectives section of this chapter.



U. S. DEPARTMENT OF THE INTERIOR  
Bureau of Land Management

LAKEVIEW DISTRICT  
1994

**GENERAL LOCATION MAP  
MAP 1**



SCALE = 1:1,000,000  
 0 5 10 15 20 25  
 MILES

## Relationship to Other Documents

The option for acquiring the Wood River property was made available after a Draft Resource Management Plan/Environmental Impact Statement (RMP/EIS) for the Klamath Falls Resource Area (KFRA) was published (August 1992). This property is approximately 25 miles from other BLM-administered land in the KFRA. Because of the timing of the acquisition and the location of the property, the BLM decided to prepare this RMP/EIS, which is equal to, but separate from, the RMP/EIS for the rest of the Resource Area. This document is and will be consistent with the decisions made in the RMP/EIS. The Records of Decision (ROD) for both plans are anticipated to be released approximately at the same time. In future resource management planning, both areas may be included in one planning document.

In 1987, the BLM completed a ROD for its *Northwest Area Noxious Weed Control EIS*. Similarly, in 1991 the BLM completed a ROD for the *Vegetation Treatment on BLM Lands in Thirteen Western States*. This Resource Management Plan/Environmental Impact Statement is tiered to those EISs. The decisions made and analyses of impacts contained in those RODs are not addressed again in the RMP/EIS alternatives.

The KFRA completed a decision record for the Integrated Weed Control Plan and Environmental Assessment (OR-014-93-09) in July of 1993. The site-specific effects of noxious weed control on KFRA lands in Klamath County, including the Wood River property, are analyzed in that document. Copies of the environmental assessment are available at the Klamath Falls BLM office.

Animal damage control activities on BLM lands in the Lakeview District have been analyzed and addressed in the supplement to the *Animal Damage Control Program draft Environmental Impact Statement* (1993) and the Lakeview District Animal Damage Control Environmental Assessment (OR-010-89-006). The effects of this program will not be reanalyzed in this document.

## Consistency with State, Local, Tribal, and Other Federal Plans

BLM planning regulations require that resource management plans be consistent with officially approved or adopted resource-related plans, and the policies and procedures therein, of federal agencies, state and local governments, and Indian tribes, so long as the RMPs are also consistent with applicable federal laws and regulations. The BLM has compared the Preferred Alternative of this draft RMP with plans from other agencies. This alternative appears to be consistent with all such plans, policies, and procedures.

## Planning Process

The EIS portion of this document is an analytical tool to assist the BLM staff in developing a resource management plan as prescribed by the Federal Land Policy and Management Act of 1976. The procedure for preparing a resource management plan involves nine steps: (1) identification of issues; (2) development of planning criteria; (3) inventory data and information collection; (4) analysis of management situation; (5) formulation of alternatives; (6) estimation of effects; (7) selection of a preferred alternative (including publishing a draft and final EIS); (8) selection of the proposed action; and (9) monitoring and evaluation. The resulting plan will be a decision document designed primarily to help district and area managers make decisions, guide the efforts of staff on a day-to-day basis, and to provide a basis for budget proposals.

Preparation of this RMP/EIS was initiated in November 1992 with the identification of the issues (step 1). The publication of this draft RMP/EIS is part of step 7 in the process. Once public comments are received and incorporated into the document a proposed action will be selected and then a final RMP/EIS and Record of Decision will be published (step 8). After plan implementation begins, monitoring and evaluation will occur (step 9) on a continual basis to ensure that the issues were addressed correctly and that the intended results (of the Record of Decision) are being accomplished.

Public involvement and consultation with affected agencies is required at several steps in the RMP process. To ensure the best possible plan, the KFRA initiated public involvement and consultation at the start of the planning process and has continued throughout the process.

## Public Involvement

The Wood River acquisition was initiated by the public and the Klamath Basin Water Resources Advisory Committee, who solicited the Congress in the fall of 1992 to appropriate funding for the BLM to purchase the property. Since then, public involvement has been an integral part of the Wood River planning process.

The BLM held scoping meetings in January 1993 and meetings of an interagency team (including members of the public) have been held monthly since May 1993. The U.S. Fish and Wildlife Service, Bureau of Reclamation, Klamath Tribe, Oregon Department of Fish and Wildlife, and Oregon Department of Water Resources are cooperating agencies in the preparation of this RMP/EIS.

To date, public involvement has included information mailers, public meetings, field trips, distribution of planning documents, document review and comment periods, informal contacts and group meetings, and the development of the Wood River Wetland Team (discussed further in the next section). Comment letters and other input received since the scoping began, have been considered while preparing the alternatives. Each part of this document was reviewed by the Wood River Wetland Team at least once before its publication.

The Klamath Tribe is a sovereign dependent nation and their participation is on a government to government basis. Due to the sensitive nature of cultural resource information, the Klamath Tribe will determine what is in their best interests regarding information sharing.

## Wood River Wetland Team

In the spring of 1993, the BLM formed an interdisciplinary interagency team, called the Wood River Wetland Team (WRWT), to assist with planning for and management of the Wood River property. Team members

include federal, state, and local government agencies; the Klamath Tribe; interest groups; neighboring landowners; and other interested individuals. The list of the Wood River Wetland Team members is included in Chapter 5.

The WRWT reviewed the Affected Environment and Environmental Consequences, and assisted with the development of management alternatives, including the Preferred Alternative. They will be reviewing the comment letters on this draft EIS, and will assist in the development of the final EIS based on those comments. The WRWT will be reviewing all proposed projects to determine if they are consistent with management goals for the property. Long-term management goals and objectives for the Wood River property developed by the BLM and the WRWT are discussed later in this chapter.

## Planning Criteria and Issues

Administration of the BLM is guided primarily by the Federal Land Policy and Management Act (FLPMA) of 1976 (90 Stat. 2742 USC 1701). Major provisions of FLPMA include: under the principles of multiple use and sustained yield, the BLM has broad management responsibility over federal lands; comprehensive resource management planning will be accomplished to properly use the lands and the resources they contain; management activities will strive to protect scientific, scenic, historical, ecological, environmental, air and atmosphere, water, and archaeological values.

In addition to this overall policy, the following state and federal laws and policies also direct and constrain management of specific resources and activities in the Wood River property area:

- American Indian Religious Freedom Joint Resolution of 1978
- Archeological & Historical Preservation Act of 1974
- National Environmental Policy Act of 1969
- Executive Order 11514 — Protection and Enhancement of Environmental Quality
- Land and Water Conservation Fund Act of 1974
- Taylor Grazing Act of 1934
- Mining Law of 1872
- Mineral Leasing Act of 1920, as amended
- Mining and Minerals Policy Act of 1970
- Geothermal Steam Act of 1970
- Executive Order 11644 — Use of Off-Road Vehicles on the Public Lands (1972)

## **Introduction**

Antiquities Act of 1906  
Historic Sites Act of 1935  
Historic Preservation Act of 1966, as amended  
Executive Order 11593 — Protection and Enhancement of the Cultural Environment  
Archaeological Resource Protection Act of 1979  
Endangered Species Act of 1973  
Fish and Wildlife Coordination Act of 1958  
Sikes Act of 1974  
Soil and Water Resources Conservation Act of 1977  
Executive Order 11990 — Protection of Wetlands  
Executive Order 11988 — Protection of Floodplains  
Clean Water Act of 1977  
Oregon Land Use Act of 1973  
National Wild and Scenic Rivers Act of 1968, as amended  
Clean Air Act of 1963, as amended  
Native American Graves Protection and Repatriation Act of 1990

Issues identified in the public meetings and by the WRWT include fish and wildlife habitat (which species will the BLM manage for), special status species (what will be done for endangered suckers), funding (where is funding for management of the property and research projects coming from, and is it guaranteed for the long term), economics and land tenure (how will the tax roles be equalized), recreation opportunities (will the property be open to hunting and fishing, what type of recreation facilities will be provided), access (what level of public access will be allowed), water resources (what will happen with water rights, how will water quality be improved), wetland restoration (what habitat types will be emphasized, how and when will the restoration occur), livestock grazing (will it still be allowed and if so, how much), and public involvement (what level of public involvement will occur).

## **Primary Issues and Effects Eliminated from Detailed Study**

Mineral and energy resources were eliminated from consideration as a primary *issue* in the formulation of alternatives because mineral development activity is not anticipated on the Wood River property, and if it was proposed then it would be analyzed at that time. If the BLM acquired the mineral estate in the future, mineral exploration and development would only be allowed if compatible with other management goals and subject to other federal and state regulations, such as the Clean Water Act, Endangered Species Act, etc.

Other issues eliminated from study and the reasoning include: timber or woodland resources (no timber values exist on the property); wilderness areas and wild and scenic rivers (none of those areas exist on the property). Use of herbicides was eliminated because this topic was fully analyzed in the BLM's 1991 ROD, *Vegetation Treatment on BLM Lands in Thirteen Western States*, and the BLM's 1986 EIS, *Northwest Area Noxious Weed Control*, as supplemented in 1987.

The following effects (environmental consequences), sometimes perceived as relevant planning topics, were eliminated from study for the reasons described: Effects on mineral resources or paleontological values (management activities are not expected to adversely or positively affect these resources); and effects on wilderness areas, wild and scenic rivers, or timber resources (none of these values or areas occur on the Wood River property).

## **Decision Making**

The ultimate decision on all activities on the BLM-administered portions of the property are the responsibility of the BLM Area Manager of the Klamath Falls Resource Area. The Wood River Wetland Team will review project proposals and provide input and expertise to the Area Manager on future projects, such as stream channel restoration techniques.

## **Monitoring the RMP**

Monitoring and evaluation of the resource management plan would be carried out at appropriate intervals for the following purposes:

- \* To be sure activities are occurring in conformance with the plan.
- \* To determine if activities are producing the expected results.
- \* To determine if activities are causing the effects identified in the environmental impact statement.

See Appendix 3 for more information.

# Research

One of the identified purposes of monitoring, to determine if activities are causing the effects expected, can only be answered by structured research. Much relevant research is already ongoing, funded by both the BLM and other agencies and parties.

Current environmental concerns in the Klamath Basin are complex in scope and involve watershed management, reservoir operation, downstream power and fisheries, wetlands and wildlife refuge, and irrigation return flow issues. A partial list of research ongoing in the basin includes:

- \* Bureau of Reclamation, Denver Office: S. Campbell, J. Sartoris, and D. Sisneros, Research projects "Basin-wide Optimum Aquatic Resource Management" and "Wetlands Ecology and Utilization," 1989 to 1995.
- \* Bureau of Reclamation, Klamath Project Office: Contracted Studies with Oregon State University, D. Markle, "Fishery studies in Upper Klamath Lake and investigation of entrainment of endangered species in irrigation delivery systems," 1990 to present; and with U.S. Geological Survey, Portland Office, M. Fretwell, G. Bortelson, and M. Darling, "Assessment of nutrient loading to Upper Klamath Lake, Oregon," 1992 to 1995.
- \* U.S. Geological Survey, Sacramento Office: S. Sorenson, "Investigation of Water Quality, Bottom Sediment and Biota Associated with Irrigation Drainage in the Klamath Basin, California and Oregon," 1988 to 1993.
- \* Klamath Tribe, Chiloquin, Oregon: J. Kann, "Studies on reservoir water quality and nutrient loading estimates in Upper Klamath and Agency Lakes, the Williamson, Sprague, and Wood River watersheds," 1987 to present.

Coordination of activities to prevent duplication of effort is of paramount importance to all agencies/parties involved in research in the Klamath Basin, because much of the funding is supplied from the federal government budget.

# Adaptive Management

Adaptive management, the process of changing land management as a result of monitoring or research, will be used. Adaptive management is a dynamic process that consists of action-based planning, monitoring, researching, evaluating, and adjusting as necessary.

# Requirement for Further Environmental Analysis

According to the National Environmental Policy Act (NEPA) new and future project proposals that are different from the proposed action of this RMP/EIS would require site-specific environmental analysis and documentation (including categorical exclusion, administrative determination where appropriate, and/or an RMP conformance determination) for each action or type of treatment under consideration. As detailed plans are developed for some of the management actions (such as ground disturbing activities) site-specific environmental analysis and documentation could also be required.

Where these action would be accomplished by a contractor, the environmental analysis would be the primary means for determining appropriate contract stipulations. Where the action would be accomplished by BLM personnel, the environmental analysis would be the primary means for determining how the action would be conducted.

Interdisciplinary impact analysis would be tiered to the framework of this and other applicable environmental Impact statements (EISs). Tiering is used to prepare more specific documents without duplicating relevant parts of previously-prepared general documents. The more specific environmental analysis can not lead directly to a change in the decisions resulting from the more general environmental analysis to which it is tiered. It could, however, result in some interim management direction pending plan revision, or a proposal to amend the plan. If an environmental

assessment indicates potential for significant impacts that are seriously different from those described in an existing EIS, a supplement to that or another EIS, or a new EIS could be required.

Specific proposals for management of competing vegetation or noxious weed control would be tiered to the BLM's Records of Decision (ROD) for the 1991 Final EIS, *Vegetation Treatment on BLM Lands in Thirteen Western States* and the 1986 EIS, *Northwest Area Noxious Weed Control Program*, as supplemented in 1987; and/or the 1993 *Klamath Falls Integrated Weed Control Program and Environmental Assessment*.

Environmental assessments (EAs) would be made available for public review in one of the following ways:

- \* Publishing upcoming EAs in the EA register (also available in the KFRA office).
- \* Advertising EAs in newspapers
- \* Upon request
- \* News releases
- \* Maintenance of mailing list to notify individuals/agencies of availability of EAs

## Long-Term Management Goals and Objectives

The primary goal for management of the Wood River property that was identified by the WRWT (with participation of the Bureau of Reclamation and the U.S. Fish & Wildlife Service as specified by the Congress) would be to restore the majority of the Wood River property to a functioning wetland community. The primary objectives would be to improve water quality and quantity entering Agency and Upper Klamath lakes; and to restore and enhance wetland habitat, primarily for Lost River and shortnose suckers, waterfowl, and secondarily for other species.

The following additional objectives would be pursued in accordance with the primary goal and objectives. Provide for public recreation (including hunting and fishing) and environmental education. Coordinate multi-agency research and adaptive management that determines the effects of wetland restoration on water quality, seasonal water regimes, water storage, and Lost River and shortnose sucker habitat on the Wood River property. Assist in the dissemination of research

results. Provide leadership and coordination during the comprehensive planning process in partnership with interested local, state, and federal agencies; landowners; and organizations to address ecosystem goals and to gain consensus on strategies and actions for restoring the Wood River ecosystem.

Results of the planning and management of the property would be used to coordinate with on-going groups, projects, and studies regarding basin-wide issues. These groups include the Sucker Working Group, Research Coordination Group, Sucker Recovery Group, and the U.S. Fish and Wildlife's Klamath Basin Ecosystem Restoration Office.

## Equalizing Tax Roles

In addition to appropriating funds and directing the BLM to consult with the Bureau of Reclamation and the U.S. Fish and Wildlife Service, the Congress directed the BLM to "dispose of [sell to private individuals or companies] appropriate lands in Klamath County to compensate for tax revenues lost by additional lands being removed from the county tax base." However, the Congress did not specify a specific method of disposal for off-setting county tax impacts, nor did it define "appropriate" lands.

Environmental analysis of the disposal actions are not included in this document, rather are being analyzed by the Klamath Falls Resource Area through a separate NEPA process concurrent with this process.

Changes in the tax base could result from any disposal or exchange unless the tax liability of the properties was the same. Several methods of equalizing tax rates are possible and are discussed below.

**Disposal based on equivalent appraised value.** This is readily accomplished as private property is acquired and BLM land is sold or exchanged at appraised fair market value. Appraisals consider the current use of the lands and the potential for development for more intensive uses in the future, given the location, zoning, views, access, and other factors.

How the public and private properties are eventually taxed would determine the impacts to the county tax base. Tax rates may be different on two equally valuable pieces of property. For example, if the BLM lands selected for disposal do not qualify for the farm deferral tax rates the taxes would be levied on the forest deferral tax rate, which is higher than the farm

rate, or real market value, which is higher than either of the deferred rates. Depending upon the ultimate tax rate the county tax base could be higher, lower, or equal to the base prior to the BLM transaction.

Using equivalent appraised values of public and private lands may not adequately compensate the county for tax losses when commercial forest lands are sold or exchanged by the BLM. On commercial forest lands with standing timber, the value of the timber can be as much as ten times the value of the land; therefore, the BLM could sell a small acreage of timber land and equal the dollar amount of the large-acreage land acquisition. This would cause a reduction in county tax receipts.

**Disposal based on equal assessed value (equal tax value).** Tax liabilities could be used to determine the total number of acres disposed of by the BLM to compensate for county tax losses. For example, the tax liability of the Wood River property for the 1991-1992 tax year totaled \$11,219 based on an assessed value of \$628,885 (Wood River Ranch appraisal). Under full implementation of Ballot Measure 5 the maximum tax liability at this assessed value would be \$9,433. Estimates of assessed value of the BLM parcels available for disposal could be requested from the county assessor's office. Public lands totalling an estimated assessed value of \$628,885 would need to be sold at fair market value to compensate for tax losses.

The BLM could also identify those parcels that would qualify for farm or forest deferral and apply the county's per acre rates by site class (assuming farm-quality public land is available for disposal). For the remaining parcels the appraised value could be assumed to represent the future assessed value. This would result in roughly equalized tax values; however, using tax liabilities is not possible because the BLM has no way of determining in advance what the taxes would be on those public lands put into private ownership before they are sold.

**Disposal of equivalent acres.** The number of private acres acquired (the Wood River property) would be equal to the number of public acres sold. This is easily accomplished as acres are readily counted, and land to be sold by the BLM must be surveyed. Again, how the public and private properties are eventually taxed would determine the impacts to the county tax base, because tax rates may be different on two equally sized pieces of property, as explained in the previous discussion on equivalent appraised value.

Use of equivalent acreage is consistent with recent legislation authorizing the Lakeview District's acquisition of the Warner Wetlands, which sets a precedent for resolving the problem of equalizing county tax roles. This legislation specifically required one acre of public property be placed into private ownership for every private acre that was acquired.

Legislative proposals introduced by Oregon Senator Bob Smith would require disposal of public lands whenever private lands are acquired by the federal government. This proposed legislation, along with the Warner Wetlands legislation, indicates the direction that the Congress may give to the BLM for equalizing losses to the local tax base from federal acquisitions.

## Subsequent Chapters

The following chapters include a discussion of the Affected Environment (Chapter 2), Descriptions of the Alternatives (Chapter 3), Environmental Consequences (Chapter 4), and Consultation and Coordination (Chapter 5). See the User's Guide at the beginning of the document for a brief description of the contents of each chapter. The document also includes Appendices, Index, Bibliography, and Glossary to aid the reader in using this RMP/EIS.

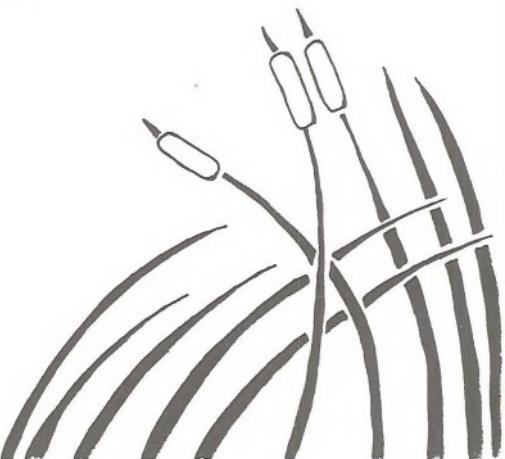


# Chapter 2

## Affected Environment

### Table of Contents

Introduction	2-2
Climate	2-2
Topography and Geology	2-2
Valid Existing Rights	2-2
Air Quality	2-3
Water Resources	2-3
Wetlands	2-7
Soil Resources	2-8
Vegetation	2-9
Noxious Weeds	2-9
Livestock Grazing	2-9
Special Status Species Habitat	2-10
Wildlife Habitat	2-11
Fish Habitat	2-13
Cultural Resources	2-14
Visual Resources	2-15
Recreation	2-15
Wild and Scenic Rivers	2-16
Mineral Resources	2-16
Socioeconomic Conditions	2-16



# Introduction

This chapter describes the physical, biological, and socioeconomic characteristics of the Wood River property in the upper Klamath Basin. This property, as described in Chapter 1 and shown on Map 2 in Chapter 3, is divided in half by a dike, referred to as the north half and south half; however, the descriptions given in this chapter are for the property as a whole. A combination of past and present conditions are described to aid the reader in understanding current and historic conditions and uses of the property. Where relevant, the descriptions include: historic use and conditions; recent private ownership use and conditions, and current BLM interim management use and conditions.

These descriptions should also aid the reader in understanding the changes that have already occurred or will occur as a result of the alternative management actions described in Chapter 3. Finally, these descriptions also serve as a baseline for analyzing and determining the effects on resources (see Chapter 4) from the various management alternatives.

The first two sections of this chapter describe the climate, topography, and geology of the upper Klamath Basin, which provides a general setting for the description of the other characteristics of the affected environment.

## Climate

The climate in the basin is semi-arid, with warm, dry summers and cool, moist winters. Average annual precipitation ranges from 10 to 15 inches. Precipitation is unevenly distributed throughout the year. Forty-four percent of the moisture occurs in winter, 22 percent in spring, 8 percent in summer, and 26 percent in fall. Snowfall accounts for 30 percent of the moisture in this area.

A wide seasonal variation of temperature occurs. Recorded extremes in the area range from -24 to +105 degrees Fahrenheit. Diurnal temperature in January varies approximately 20 degrees; in July, the variance is approximately 40 degrees. Freezing temperatures may occur in every month of the year. The average frost-free season is approximately 126 days.

In the city of Klamath Falls, the prevailing winds are southerly from November through February, westerly from March through July, and northerly from August

through October. Thunderstorms, with an occasional severe hailstorm, can occur throughout the year. Relative humidity in Klamath Falls averages 62 to 74 percent in winter, and 26 to 33 percent in summer.

## Topography and Geology

The Wood River property lies at the upper end of the Klamath Basin, approximately 25 miles north of the city of Klamath Falls, Oregon (see Map 1). The 3,220-acre parcel is basically flat, with elevations ranging from approximately 4,138 to 4,140 feet above sea level on the main property's interior and approximately 4,135 to 4,150 feet across the entire parcel. It is bounded on the east by the Wood River and Wood River Marsh, approximately 300 acres of permanently flooded marsh which lies outside of the diked area; on the west by Sevenmile Creek; on the north by a dike; and on the south by Agency Lake (see Map 2 in Chapter 3). The south end is diked to keep Agency Lake from flooding most of the parcel.

The upper Klamath Basin lies within the north-northwest trending Klamath Graben, a downthrown fault block (a body of rock bounded by one or more faults) located at the extreme northwestern margin of the Basin and Range physiographic province. The property is underlain by Quaternary-age deposits of lacustrine (lake) diatomaceous clays and silts, and alluvial floodplain deposits of volcanic ash-rich clays, silts, and sands. The diked and drained areas, and the ponded Wood River Marsh consist of peat, muck, and diatomaceous silts. See the Soil Resources and Mineral Resources sections for further information.

## Valid Existing Rights

The Wood River property is mostly unimproved (without buildings or structures), but has a bunkhouse and corrals to manage cattle on the north half. Two electric drainage pumps are located at the northeastern end of the central drainage ditch and one pump is at the southwest corner of the property.

Prior to the BLM's acquisition, adjoining landowners purchased or were given the right to use roads on the Wood River property to access adjacent properties. The Pacific Power and Light Company holds several rights-of-way for electrical distribution lines that serve pumps on the Wood River and neighboring properties.

Rights-of-way for drainage canals, which border the property, and for water distribution on the property have been given to the Meadows Drainage District. An easement (see Glossary) was given to Klamath County on November 7, 1969 to provide public boating access by canal to the Wood River and Agency Lake from Petric County Park. The Wood River and canal from Petric Park are considered public waterways, with the State Marine Board in control of speed limits.

## Air Quality

The passage of the Clean Air Act in 1963 and subsequent amendments requires the state of Oregon to meet visibility and health standards through development of a State Implementation Plan (SIP). Oregon's SIP has been approved, as required, by the Environmental Protection Agency. The SIP identifies population centers in the state that do not need the National Ambient Air Quality Standards. Those elements identified in the SIP associated with resource management activities in the planning area are smoke from prescribed burning, fugitive dust from barren fields, and dust from roads or maintenance of roads/dikes.

Smoke is comprised of particulate matter (PM), which is one of the criteria air pollutants. Particulate matter with a nominal size of 10 microns or less (PM-10) is the specific pollutant of concern identified in the SIP. Klamath Falls is currently in violation of the PM-10 standard and is classified as a non-attainment area for this pollutant. Generally, non-attainment status is the result of winter periods of air stagnation and particulate pollution from wood stove use. Fugitive dust from recently tilled bare ground has on occasion contributed to higher levels of PM-10.

Burning is regulated by the Oregon Smoke Management Plan (OSMP), a part of the SIP (ORS 477.515 [3.a] and [3.b] and OAR 629-43-043). The Wood River property is located with an area in which a part of the OSMP designates as the Klamath Falls special protection zone. Burning is not allowed to affect the National Ambient Air Quality Standards of the special protection zone from November 1 to April 1. Therefore, burning is regulated within the county through burning permits and Klamath County Ordinances. Open burning is regulated to avoid periods of stable atmospheric conditions. Woodstove use has been successfully curtailed in the Klamath Falls urban area through the burn advisories (red, yellow, or green) to avoid violating National Ambient Air Quality Standards.

The Wood River property is located a short distance (8-12 miles) east to southeast of several Class 1 Air

Quality areas (defined by the Clean Air Act as having basically "pristine" conditions). These include Crater Lake National Park, and Mountain Lakes and Sky Lakes Wilderness Areas. Located 25 to 30 miles east is Gearhart Wilderness. Burning, which would impact visibility, is prohibited by law from July 1 to September 15 of each year.

Prescribed fire on the Wood River property has historically only contributed minuscule amounts of smoke to the Klamath Basin airshed (see Glossary). Dust associated with tillage, dike repair, and road use is a larger contributor to particulate matter content in smoke and visibility impairment, and then only in a localized area.

## Water Resources

Agricultural use has occurred for more than 100 years in the region, possibly dating back to 1860. Early developments by the Fort Klamath Meadows Company in the Wood River Valley occurred in the 1910s and 1920s. This development consisted of reclamation of wetlands and their conversion into agricultural lands. Total developments resulted in approximately 27,000 acres of partially reclaimed wetlands and meadowlands. Additional reclamation of marshlands around the lake for agricultural use has occurred over the last 50 years. The result of this agricultural development has led to the net loss of over 30,000 acres of wetlands around the periphery of Agency Lake, of which 23,000 acres occurred in the Williamson River Delta and the Wood River Valley (USBR 1992).

Numerous farms and ranches in the Fort Klamath area divert significant quantities of water out of the various streams and springs in the Wood River watershed upstream from and adjacent to Agency Lake. The natural streams in the watershed include Sevenmile Creek, Fourmile Creek, Annie Creek, Fort Creek, Agency Creek, Crooked Creek, and Wood River. Additionally, water from various natural springs is diverted to various maintained ditches which supply irrigators in the area. Bluespring, Sevenmile, and Melhase are the major ditches conveying water from the natural creeks and springs to the irrigators. Return flows from these ditches are collected into several canals that connect with and are adjacent to Agency Lake. These canals, which contain water year round, include West, Sevenmile, Central, and North canals, among others (USBR 1992).

A large amount of the water diverted to irrigation ditches from Sevenmile Creek and Wood River is recovered to the ditches as return flows, entering

Agency Lake. Depending on land practices, use of chemicals, number of reuses and erosion, the water quality of these return flows ranges from fair to extremely poor. The nutrient-rich return water potentially results in bluegreen algal blooms, anoxic conditions (insufficient dissolved oxygen levels), and elevated pH levels within Agency Lake, which potentially affects the water quality of Upper Klamath Lake (USFWS 1992a). See the Water Quality section for more information.

## Water Rights

Water rights are a type of property right and are attached to the land where they were established. Water rights for the Wood River property are issued to the Meadows Drainage District. The water delivered to the Wood River property comes through a system of canals and ditches operated and owned by the Meadows Drainage District. The district's water right allows for diversion of 200.5 cubic feet (see Glossary) per second (cfs) from the Wood River near Fort Klamath (where Weed Road crosses the Wood River). Of this amount, a landowner in the Drainage District could divert up to 0.0125 cfs per acre, or its equivalent for each acre irrigated, from the Wood River Canal to his/her property. Additional information on Oregon State water laws can be obtained from the Klamath County Watermaster or the State of Oregon Water Resources Department.

## Wood River Ranch Water System Operations

The Meadows Drainage District delivers irrigation water and provides drainage services to much of the Wood River Valley. This district, organized according to the laws of the state of Oregon, is essential to management of water on the Wood River property. All the drainage district members cooperate in the use of water and usually coordinate diversions and irrigation deliveries informally through phone calls.

The Meadows Drainage District diverts water through the Bluespring, Sevenmile, and Melhase Ditches and collects return flows in West, Sevenmile, Central and North Canals, among others. The District provides irrigation water for approximately 20,000 acres. In addition to District water users, many individual landowners, farmers, and ranchers are provided water via these ditch systems. These landowners each irrigate from several hundred to several thousand acres. Many of these landowners (particularly the largest) irrigate pasture lands for hay and livestock production. These water diversions are taken under

Oregon Water Rights; the allotments for each land-owner average 3.5 to 5.0 acre feet per year (USBR 1992).

Depending on the weather and the year, ditch diversion deliveries to lands served by the Meadows Drainage District begin about mid-April and terminate in late September. The heaviest consumption and deliveries are from mid-May to mid-August, tapering off at the end of the irrigation season. Much of the water used throughout the District re-enters the ditches for further use downstream and much of this return flow drains to the downstream canals which convey this water to Agency Lake. After deliveries are finished in the fall the ditches and canals are allowed to dry up during the non-irrigating season (USBR 1992). Because the Wood River property is in the farthest downstream portion of the irrigation district, its use (or non-use) of water does not adversely affect uses by other District members (Hawkins, pers. comm. 1993).

In the spring runoff period and into early summer, water is pumped off the Wood River property to drain it. This water is pumped into the Wood River and Sevenmile Canal, which flow into Agency Lake. Later in the summer (July, August) when the ground dries out, water is gravity fed onto the property for irrigation. Of the two main diversions serving the property, the greatest portion of water used for irrigation comes from the Sevenmile Canal, which contains a higher proportion of irrigation return water than the Wood River Canal (Hawkins, pers. comm. 1993). Both diversions operate by gravity head gates.



Head Gate

Photo by: Ron Hicks

## Water Quality

Upper Klamath Lake is a shallow lake, with a mean depth of approximately eight feet and a surface area of about 85,000 acres (USBR 1992). Agency Lake forms a shallow, northerly arm of Upper Klamath Lake. Historically eutrophic (see Glossary), Upper Klamath Lake has become hypereutrophic (see Glossary) (USFWS 1992a, Kahn and Smith 1993). Upper Klamath Basin wetlands have been reduced from over 350,000 acres prior to 1905 to less than 75,000 acres today. It has been theorized that conversion of wetlands, which retain nutrients, to croplands has resulted in an increase of organic nutrient input to Upper Klamath and Agency lakes (USBR 1992). Excessive nutrient supply is primarily responsible for the current hypereutrophic status of the lakes. In summer and fall, nutrient input results in massive bluegreen algae blooms (USBR 1992). Other proposed reasons include changes in the timing and rate of lake flushing from dam regulation, wetland and riparian losses, irrigation diversions, and hydrologic alterations from forest practices. In addition, decreases in lake level due to both regulation and irrigation releases may cause the lake to be more conducive for algal production through warmer temperatures and higher nutrient from decreased lake volume (USFWS 1992). Loss of wetlands have also altered lake nutrient cycling and inputs of nutrients, as well as decreased the capacity of Upper Klamath and Agency Lakes to store water (USBR 1992).

Lake nutrient cycling and inputs of nutrients to the lake have been altered, and it has been hypothesized that, as a result, the algal community has shifted to more of a monoculture of the bluegreen algae, *Aphanizomenon flos-aquae*, which is more efficient than green algae at using low concentrations of carbon dioxide. High water temperatures and nutrient cycling resulting from a lack of lake stratification (see Glossary) are favorable for blue-green algae growth. Massive blooms of algae that can occur during the summer and fall can cause extremely high pH levels, wide fluctuations of dissolved oxygen and carbon dioxide levels, high concentrations of phosphorus, a green appearance and foul odors as the algae decays, and possibly an algal toxicity problem (Kahn and Smith 1993, USBR 1992, U.S. Army Corps of Engineers 1982). Fish kills in 1971 and 1986 are thought to have been caused by water quality problems associated with the algae, such as dissolved oxygen depletion from high water temperatures and extensive algal decay (USFWS 1992a).

Water quality in Upper Klamath Lake during the summer and fall can quickly degrade to pH values in

excess of 10.0 and dissolved oxygen concentrations as low as 0.3 mg/l. On several occasions in recent years, pH levels have been above 9.5 in most of Upper Klamath Lake during the summer and early fall; in June 1992 pH levels as high as 10.5 were measured in the water leaving the lake through the A-Canal (USFWS 1992a, Kahn and Smith 1993, Monda and Saiki 1993).

The role of internal nutrient loading is uncertain. Studies of Upper Klamath Lake bed sediments showed that concentrations of nitrogen and phosphorus in the interstitial water (see Glossary) of Howard Bay sediment were several times higher than those near Buck Island and the lake outlet. This was believed to be the result of agricultural drainage from nearby ranches (USFWS 1992a). A sediment core taken near the outlet of the lake indicated an accelerated rate of sedimentation in more recent years, possibly related to changes in the watershed and productivity of the lake (USFWS 1992a).

In 1988 the Oregon Department of Environmental Quality (DEQ) conducted an extensive inventory of water quality problems in the state, the 1988 *Oregon Statewide Assessment of Nonpoint Sources of Water Pollution*. This report lists waterbodies where serious nonpoint source pollution problems are known to exist, or have been reported without challenge, based on information in the DEQ assessment report. Results of the 1988 Assessment for Wood River, Sevenmile Creek, Agency Lake, and Upper Klamath Lake are listed in Table 1. Additional information on the status of water quality in the Klamath Basin and on DEQ's water quality programs is contained in the Oregon DEQ *Water Quality Status Assessment (305[b]) Report* (1992).

A Lake Water Quality Assessment is being conducted in Upper Klamath Lake by the Klamath Tribe as part of the Environmental Protection Agency's Clean Lakes Program. The goal of this project is to assess current water quality conditions and dynamics in the lake. Specific objectives of the project are to assess in-lake nutrient concentrations, monitor water quality parameters, and assess phytoplankton composition and biomass throughout the phytoplankton growth period; as well as to assess surface water loading of major algal-growth nutrients to Upper Klamath Lake. Data is currently being tabulated and analyzed for measured parameters (DEQ 1992).

The U.S. Bureau of Reclamation has funded a five year study to be conducted in coordination with the U.S. Geological Survey and Klamath Tribe to determine the source and relative magnitudes of nitrogen

**Table 1. Results of the 1988 Oregon DEQ Statewide Assessment of Nonpoint Sources of Water Pollution.**

Waterbody Name	Pollution Type	Severity (Info. Source)	Impacted Beneficial Uses	Probable Causes
Upper Klamath Lake	Pesticides	Severe problem (data)	-Cold Water Fisheries -Warm Water Fisheries -Water Recreation -Aesthetics	-surface erosion -irrigation withdrawal -reservoir storage and releases -channelization/ wetland drainage
	Toxics	Severe problem (data)		
	Solids	Severe problem (observation)		
	Sedimentation	Severe problem (data)		
	Excessive Plant Growth	Severe problem (data)		
Agency Lake	Pesticides	Moderate problem (observation)	-Cold Water Fisheries -Warm Water Fisheries -Water Recreation -Aesthetics	-surface erosion -irrigation withdrawal -reservoir storage and releases -channelization/ wetland drainage
	Toxics	Moderate problem (observation)		
	Sedimentation	Severe problem (data)		
	Excessive Plant Growth	Moderate problem (observation)		
Wood River	Turbidity	Moderate problem (observation)	-Cold Water Fisheries -Wildlife -Water Recreation	-riparian vegetation and bank disturbance -traffic -flow alteration
	Low Dissolved Oxygen	Moderate problem (observation)		
	Nutrients	Moderate problem (observation)		
	Sedimentation	Moderate problem (observation)		
	Streambank Erosion	Moderate problem (observation)		
	Decreased Streamflow	Moderate problem (observation)		
	Insufficient Stream Structure	Moderate problem (observation)		

**Table 1. Results of the 1988 Oregon DEQ Statewide Assessment of Nonpoint Sources of Water Pollution. (continued)**

Waterbody Name	Pollution Type	Severity (Info. Source)	Impacted Beneficial Uses	Probable Causes
Sevenmile Creek	Turbidity	Moderate problem (observation)	-Cold Water Fisheries -Other Aquatic Life -Wildlife -Aesthetics	-surface erosion -changes in flow pattern timing -elimination of thermal cover to stream
	Low Dissolved Oxygen	Moderate problem (observation)		-traffic -vegetation removal
	Nutrients	Severe problem (observation)		-irrigation withdrawal -altered physical characteristics of stream
	Solids	Moderate problem (observation)		-channelization/wetland drainage -placement of instream structures
	Sedimentation	Moderate problem (observation)		
	Streambank Erosion	Moderate problem (observation)		
	Decreased Streamflow	Moderate problem (observation)		
	Insufficient Stream Structure	Severe problem (observation)		

and phosphorus loading in ground and surface water discharge from natural and disturbed lands (primarily agricultural and forestry disturbances). The study will also examine the role that reservoir water surface regulation has played in moving nutrients through Upper Klamath Lake, as well as nutrient availability (USFWS 1992a).

Additional information on water quality studies and other research being conducted in the Klamath Basin can be found in *Environmental Research in the Klamath Basin, Oregon: 1991 and 1992 Annual Reports* (USBR 1993a, USBR 1993b).

## Groundwater

The Wood River property lies in the Upper Klamath Lake groundwater sub-basin in a groundwater discharge area. In groundwater discharge areas, precipitation generally does not enter the groundwater system, rather it is evaporated, transpired, or leaves as surface runoff. The aquifer for the property is comprised of pumice, sand, chalk, gravel, clay, or cinders. The groundwater table is shallow, with some artesian

(free-flowing) wells, including one in the northeastern corner of the property. The Wood River Valley drains from Devil's Peak in the Sky Lakes Wilderness Area north along the crest of the Cascades to Crater Lake; southeast from Crater Lake to Sand Ridge; southeast from Sand Ridge to the town of Chiloquin; then northwest from Chiloquin back to Devil's Peak (Oregon Water Resources Board 1971). The U.S. Geological Survey is in the process of conducting a groundwater study of the Agency Lake-Upper Klamath Lake area. No information has been found on the quality of groundwater in the area.

## Wetlands

There are several types of wetland habitats that occur on the Wood River property. The classification system used to describe these habitats was established by the U.S. Fish and Wildlife Service (USFWS) and was used in mapping wetland areas for their National Wetlands Inventory. This classification system is described in *Classification of Wetlands and Deepwater Habitats of the United States* (USFWS 1979, reprint 1992b).

National Wetlands Inventory maps and related information can be obtained from local USFWS or Soil Conservation Service offices.

This classification system uses modifiers to describe the plants, soil types, and frequency of flooding that define a particular wetland habitat. These modifiers, which are a hierarchy in the classification system, are combined and used in the National Wetland Inventory Maps. The following description is a brief summary of the wetland types found on the Wood River property, as mapped by the USFWS. Definitions of the modifiers used in the following paragraphs can be found in the Glossary.

The main part of the property (north and south halves) is classified as an emergent, seasonally flooded, diked/impounded and partially drained/ditched palustrine (swamp) wetland. There are some smaller areas in the northeast corner of the property that are classified as emergent, temporarily flooded palustrine wetlands and emergent, seasonally flooded palustrine wetlands.

The Wood River Marsh is a complex of predominately three wetland types: a littoral, aquatic bed, permanently flooded, diked/impounded lacustrine (lake) wetland; an emergent, temporarily flooded, diked/impounded emergent palustrine wetland; and an emergent intermittently exposed, diked/impounded palustrine wetland.

A copy of the National Wetlands Inventory map for the Wood River property can be viewed at the Klamath Falls Resource Area office.

## **Soil Resources**

According to the Soil Survey of Klamath County (Soil Conservation Service [SCS] 1985), three soil types occur on the property - ponded histosols, Kirk-Chock association, and Lather Muck association. The following narrative describes where the soil types are found in the general area and some of the important characteristics of the soils; more specific information is available at the Klamath Falls Resource Area office or through the SCS. Certain vegetation types, described in the Vegetation section, are associated with these soil types.

### **Ponded Histosols**

The ponded histosols are generally found in ponded, marshy sites that are underlain by stratified layers of

peat, muck, and diatomaceous silt. They are found on the fringes of the Upper Klamath and Agency Lakes, including in the Wood River Marsh. The marsh, which is east of the Wood River and north of Agency Lake, is covered by up to three feet of water. Numerous submerged stream channels with water considerably deeper than three feet, areas where aquatic plants form a nearly continuous marsh cover, and large intermittent patches of open water also are mapped with this soil type.

### **Kirk-Chock Association**

The northern third of the property (the upland area) has soils classified as Kirk-Chock association. These are poorly drained soils that occur on floodplains, and are formed in alluvial deposits on ash and cinders from volcanic dacite pumice flows. The surface is mostly uneven and hummocky, with slopes less than one percent. Permeability is rapid in the Kirk soil and moderate in the Chock soil. Runoff is very slow, and the hazard of erosion is slight except during periods of flooding, when channeling occurs. The soils are subject to frequent flooding in spring where not protected by dikes.

These soils are better suited to sprinkler irrigation of high value crops than to other irrigation methods; subirrigation probably increases the content of sodium and salt in the upper part of the soils. The surface layer of these soils is moderately alkaline in many places, which probably results from the current practice of subirrigating as well as surface irrigating.

### **Lather Muck Association**

The southern two-thirds of the property contains soils of the Lather Muck association. These are very poorly drained soils on nearly level, reclaimed (diked and drained) bottomland north, west, and south of Agency Lake and in other diked and drained areas adjacent to Upper Klamath Lake. These soils formed in very deep deposits of partly decomposed fibrous organic material that has one or more thin layers of diatomaceous silt. This soil is frequently flooded for long periods of time; the water table, controlled by pumping from drains, is generally zero to three feet deep. Runoff is very slow, and the hazard of water erosion is slight. When the surface layer dries, the soil is subject to fires, as well as to blowing when disturbed by cultivation or traffic.

This moderately permeable soil is suited to sprinkler and border irrigation. Regardless of what method is used, maintaining uniform soil moisture above the water table to minimize unequal subsidence and reduce the hazard of fire is important. It is especially

important to prevent the soil from drying completely in any part, because once it is dry, fibrous peaty material may be extremely difficult or impossible to rewet. The soil also can be subirrigated, but subirrigation can result in accumulation of excess sodium and salt in the upper part of the soil over a period of years. Alternative use of other irrigation methods at periodic, long term intervals is needed to maintain an acceptable salt balance in the soil where subirrigation is the usual method.

## Prime and Unique Farmlands

None of these three soil types is considered Prime (see Glossary) according to the Soil Conservation Service classification. The local SCS office did not have a listing of Unique soils for Klamath County but said that these soils probably would not be considered Unique (see Glossary) because they are not considered Prime. A map of precise soil type locations can be viewed in the Klamath Falls Resource Area office.

## Vegetation

Vegetation on most of the Wood River property, which has been managed for pasture forage (grasses and forbs) the past few decades, is the result of intensive management for livestock production (see Appendix 1 for a partial list of plant species found on the property). This is shown by the difference between existing and native vegetation.

### Pasture

The northern third of the Wood River property, with soils classified as Kirk-Chock association, is dominated by Kentucky bluegrass (*Poa pratensis*). The native vegetation on this soil association is described as a wet meadow plant community dominated by tufted hair-grass (*Deschampsia caespitosa*), with northern manna-grass (*Glyceria borealis*), reedgrass (*Phragmites communis*), and Nebraska sedge (*Carex nebrascensis*) in very wet spots (SCS 1985). This portion of the property has been used mainly for irrigated pasture and wildlife habitat.

The southern two-thirds of the property, with soils classified as Lather Muck association, is currently dominated by quackgrass (*Agropyron repens*). These poorly-drained soils are derived from reclaimed lake bottom sediment, so the native vegetation probably consisted of wetland and emergent vegetation, such as bulrush (*Scirpus spp.*), cattail (*Typha spp.*), and

wocus lily (*Nuphar polysepala*). This portion of the Wood River property with Lather Muck soils has been used mainly for irrigated pasture.

## Aquatic and Emergent Vegetation

The southeast portion of the property is part of the Wood River Marsh, which has water depths up to three feet. The native vegetation, which is also the existing vegetation, includes aquatic and emergent vegetation, growing in ponded histosol soils. The area is dominated by bulrush and cattails, with wucus lily in some of the deeper water areas. Plant species comprising the submerged/emerged vegetation in this area include curly leaf pondweed (*Potamogeton crispus*), coontail (*Ceratophyllum demersum*), sago pondweed (*Potamogeton pectinatus*), horsetail (*Equisetum sp.*), and other pondweeds (*Potamogeton spp.*).

## Woody and Riparian Vegetation

Willows (*Salix sp.*) are scattered in the southeast portion of the property and along the Wood River riparian area, which forms the property's northeast boundary. A narrow strip (approximately one acre) of willows and cottonwoods (*Populus sp.*) occurs along the ditch bank of the main access road on the southern edge of the property.

## Special Status Plants

See Special Status Species Habitat section.

## Noxious Weeds

Bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), bitter nightshade (*Solanum dulcamara*), and quackgrass (*Agropyron repens*) have been noted on the Wood River property. Foxtail grass (probably *Hordeum jubatum*) occurs on adjacent farmland. Bull thistle, Canada thistle, and quackgrass are on the Oregon Department of Agriculture's "B" noxious weed list; however, Canada thistle, which is not very abundant on the property, is the only one of those treated as a noxious weed by Klamath County. Although all parts of bitter nightshade are toxic, neither it nor foxtail grass are on the Oregon Department of Agriculture's noxious weed list. They are, however, described in the *Weeds of the West* (Whitson 1991).

# Livestock Grazing

As part of the Wood River property purchase agreement between the American Lands Conservancy (ALC) and the BLM, a temporary, non-renewable grazing lease was issued. This lease authorized grazing through November 30, 1994. The lease was issued to help facilitate the purchase transaction, to allow time for baseline data on various resources to be collected, and to allow the BLM time to prepare a management plan.

During the past five years of private ownership the ranch was operated as a cow/calf (called a pair) operation with up to 1,300 pairs of cattle. The season of use was typically late April through November, although the on and off dates varied. Currently, the BLM and ALC grazing leases have a season-of-use of May 1st through November 30th, with up to 1,300 pairs (a maximum of 7,200 AUMs) authorized. Use beyond that date is contingent on the decisions made on this EIS and management plan.

Drainage ditches dissect the Wood River property into pastures of varying size and act, along with a few short fences, gates, and cattleguards, as reasonably effective barriers to livestock movement. The cattle are grazed rotationally through all of the pastures resulting in multiple periods of grazing followed by regrowth in each pasture. The pastures are variably flooded to enhance regrowth during the growing season.

The dominant forage grass in the south portion of the property is quackgrass, with the north portion dominated by Kentucky bluegrass (see the Vegetation section). In the Klamath Basin, soils that produce these types of dominant grasses, and are periodically flood irrigated, can be grazed intensively up to a maximum of 250 to 350 animal days or 8-12 animal unit months per acre (Randy Dovel, pers. comm. 1993). Besides being used as forage, some of the pasture areas, particularly in the east central portion of the property, were occasionally cut for hay.

# Special Status Species Habitat

Special status species include those that are federally listed (threatened or endangered), federally proposed to be listed, federal candidate, state listed (threatened or endangered), Bureau sensitive, and Bureau assessment species (see Glossary).

## Special Status Wildlife Species

Several species of concern have either been documented in the area or potentially occur in the habitats found on the Wood River property. Table 2 lists special status wildlife species and their status.

Several federally listed species, such as the bald eagle, shortnose sucker, and the Lost River sucker use the area on a year-round basis. See the Special Status Fish Species section for a discussion of the suckers. Other special status species, such as the tricolored black bird, long-billed curlew, and the white pelican, use the area seasonally.

**Table 2. Special Status Wildlife Species Known or Suspected in the Wood River Area**

Species	Status
Bald eagle	FT/ST
Peregrine falcon	FE/SE
Shortnose sucker	FE/SE
Lost River sucker	FE/SE
Klamath largescale sucker	FC
Long-billed curlew	FC
Redband trout	FC/SS
Western pond turtle	FC/SS
White-faced ibis	FC/SS
Spotted frog	FC/SS
Tri-colored blackbird	FC/SS
Black tern	FC/SS
Loggerhead shrike	FC/SS
Least bittern	FC/SS
Greater sandhill crane	AS/SS
Snowy egret	AS/SS
Bank swallow	AS/SS
Western bluebird	AS/SS
Great egret	AS/SS
Yellow rail	AS/SS
American white pelican	AS/SS
Horned grebe	AS/SS

FT = Federal Threatened

FE = Federal Endangered

FC = Federal Candidate (category 2)

AS = BLM Assessment

ST = State Threatened

SE = State Endangered

SS = State Sensitive

Recently, several spotted frogs (federal candidate species) were discovered on the Wood River property. Historically this frog occurred throughout the Basin, but a 1993 field search of historical sites yielded no frogs (Marc Hayes, pers. comm. 1993). This discovery on the Wood River property is the only documented occurrence of the spotted frog in Klamath County in many decades.

Use of habitats is discussed in the Wildlife Habitat and Fish Habitat sections.

## Special Status Fish Species

The Lost River and shortnose suckers (both federally endangered species) are native to waters of the Klamath Basin. These species are primarily lake dwelling species that migrate up tributaries to spawn. After spawning they return to the lake environment.

The Lost River sucker has been documented in Wood River, Sevenmile, and Crooked Creeks (Stubbs & White 1993). Larval Lost River suckers were found in Crooked Creek and Wood River in 1991 (USBR 1993b). This indicates that the Wood River is still important for spawning migration for the adult Lost River sucker.

Shortnose suckers and Klamath largescale suckers (a federal candidate species) may also occur in the Wood River, however, neither species has been documented (John Fortune, pers. comm. 1993). Both endangered suckers are found in Agency Lake, which adjoins the Wood River property.

## Special Status Plant Species

No populations of special status plant species are known to occur on the Wood River property. However, the Kirk-Chock soil association on the northern third of the property (poorly drained loams subject to frequent flooding unless they are protected by dikes) is similar to the Henley-Laki loams that support the few known populations of Applegate's milkvetch (*Astragalus applegatei*), a species that is federally listed as endangered. Although the descriptions of the two soil types contain some differences, the loams on the northern third of the property should be considered possible habitat for Applegate's milkvetch since little is known about the precise habitat requirements of this species.

# Wildlife Habitat

The Wood River property provides for a great abundance and variety of wildlife species. Four primary habitat associations are discussed in this section: Permanent wetlands with aquatic or emergent vegetation; pastures (or meadow) of short grass communities that are dissected by a series of canals; woody and riparian vegetation areas, mostly along the dikes and Wood River; and open water areas on the lake and near the shoreline. See the vegetation section for further descriptions of these habitat types.

Wildlife using the Wood River property generally obtain one or more of the following life cycle needs: Foraging (feeding); roosting (resting); breeding, nesting, brooding, or rearing; staging (gathering) during migrations; denning (sheltering); basking (sunning); or other. Different life cycle needs are often supplied in different habitat types (for example, foraging in the pastures/meadows and roosting in the riparian areas). Wildlife could also use one, or more, habitat types differently depending on the season (for example, the pastures/meadows could be used as nesting habitat in the spring and foraging habitat in the fall). Other wildlife species use the area on a seasonal basis only.

In general, throughout this document the term waterfowl includes ducks, geese, and pelicans. Wading birds include species like herons and egrets, while shorebirds would include species like the long-billed curlews, sandpipers, phalaropes, and ibis. Species like tri-colored blackbirds, meadowlarks, wrens, warblers, orioles, and sparrows are included in the neotropical migratory bird category. The term raptor includes species like eagles, owls, hawks, osprey, and northern harriers. Small mammals would include ground squirrels, mice, and voles. The furbearers term refers to species such as otter, beaver, and muskrat. Species like the spotted frog, western pond turtle, and bull frogs would be included in the terms amphibians and reptiles. Appendix 2 provides a list of animal species suspected or documented in the Wood River property area.

## Pasture/Meadow Habitat

Some species will forage in this habitat type year-round if weather conditions permit (such as snow cover and open water). Other species such as the northern harrier and bald eagle will use the area year-round but use increases when weather conditions allow prey availability. Species likely to nest in this habitat type include many species of waterfowl, shorebirds, and neotropical migratory birds. Several species, such as white-fronted geese and various shorebirds use this habitat type as a staging and stop-over area during migration.

Some animals, such as small mammals, are likely to use this habitat type throughout their lives. Irrigation canals on the Wood River property appear to be important for the spotted frog (a federal candidate species - see the Special Status Species section).

## Aquatic and Emergent Vegetation/Wetland Area

Animals that forage year-round in this habitat type include many species of waterfowl, raptors (including bald eagles), and wading birds. Seasonal foragers include many species of neotropical migratory birds, and some raptors. Species that nest in this habitat type include many species of neotropical migratory birds, shorebirds, and some raptors, such as the northern harrier. Many birds use this habitat type during migrations; waterfowl, neotropical migratory birds, and a variety of shorebirds. Waterfowl also use this habitat type for brooding and loafing.

Wetland habitat is also important to the furbearers for foraging and denning. Amphibians and reptiles may use this habitat for most if not all their life cycles.

The kind of wildlife that use the area, and the type of use is influenced by the depth of the water, the percentage of vegetation to open water, and the height of vegetation. Deeper water will favor diving ducks, such as redheads, ruddy ducks, and mergansers. The deeper water also takes longer to freeze and is open for staging and resting areas for migrating waterfowl. Shallower water favors puddle ducks, such as mallards, pintails, and teals; and wading birds such as herons, egrets, and shorebirds. These birds forage in the shallow waters because of an abundance of insects and desired vegetation.

Vegetation type and density also influences the type of wildlife use. Dense cattails provide forage and den



Wildlife habitat.

Photo: Ron Hicks

construction material for muskrats. The stiffer and taller emergent vegetation (such as cattails) also provide nesting structure for birds, such as yellow headed blackbird, tri-colored blackbird, common yellowthroat, and marsh wren. Waterfowl, such as redheads, use these vegetation clumps as nest sites and brood rearing areas.

The open areas within the marsh are used as foraging areas by terns, diving ducks, and swallows. These open areas are subject to wind action which causes a mixing of water. This mixing creates a wide variety of insects and plants that may be available to wildlife. It also delays freezing so open areas may be available longer.

The combination of water depth and vegetation type can also be important. Shallow water with short sedge and grass communities is desired by Canada and white-fronted geese and the yellow rail. The spotted frog prefers water 18 to 24 inches in depth with dense sub-emergent vegetation. This allows the surface water to heat up to the preferred temperature, yet allows deep escape water nearby. Both the yellow rail and spotted frog are special status species and their preferred habitats could become critical.

## Riparian

Riparian habitat is used extensively by wildlife for nesting. Species that nest in this habitat type include waterfowl, wading birds, neotropical migratory birds, and raptors. Rough-legged hawks and other raptors may use the riparian habitats during the winter for foraging and roosting.

Riparian habitat is used extensively by furbearers for foraging and denning. Reptiles and amphibians may be found denning, feeding, and basking here. Small mammals also use riparian habitat extensively for all their life cycle needs.

Riparian areas are probably the most widely used and important habitat for wildlife. Many species will rely on or use riparian areas for part of their life cycles. Over 80 percent of the species identified in the area rely on or will select riparian zones for part of their life cycle.

Riparian zones with vegetative structure (such as shrubs and trees) are extremely important to neotropical migrants both during the migration and nesting season. The stand of tall poplar trees along the main dike road has the highest bird diversity on the Wood River property.

## Open Water Habitat

The lake front habitat is used by fewer wildlife species, but is no less important. Waterfowl and some raptors, such as bald eagles, use this habitat for foraging on a year-round basis. Seasonal foragers include osprey and a variety of shorebirds. Waterfowl also use this habitat for loafing and staging. During migrations some shorebird species will use the edges of open water areas.

## Fish Habitat

Fish that use streams and marsh areas in or adjacent to the BLM-administered property include cold water fish, such as brown and rainbow trout; and warm water fish, such as fathead minnows, largemouth bass, sunfish, and sucker fish (such as Lost River, short-nose, and Klamath largescale). The suckers are special status species and are discussed under that section.

The Wood River, which is managed by the Oregon Department of Fish & Wildlife as a wild trout stream, contains resident, self-sustaining populations of brown

trout. This is the river's main fishery during the summer. In the fall, migratory rainbow trout use the river; they reside in Agency and Upper Klamath lakes and migrate up the Wood River to spawn. The young trout may remain in the river for one to two years before moving out to Agency and Upper Klamath lakes, where they grow until they are ready to spawn. The stretch of Sevenmile Creek that is adjacent to the BLM-administered land has been channelized so the potential of the fish habitat in that stretch is uncertain, although it receives some use for rearing habitat by young rainbow and brown trout. Sevenmile Creek is also used by rainbow trout migrating out of the lake (Roger Smith, pers. comm. 1993).

Stream habitat conditions that are important to fish include structure (such as vegetation, large woody debris, and deep pools), temperature regulation, substrate (bottom conditions), and clean flowing water. A wide variety of habitat conditions currently exist in the Wood River, with structure and substrate as possible factors limiting habitat quality (Roger Smith, pers. comm. 1993).

Much of the Wood River lacks sufficient structure (large woody material and pools) that would provide good hiding cover for the fish. The bottom condition (substrate) is primarily mud and does not provide good spawning areas for fish. More sand or gravel areas are needed to provide better spawning conditions.

The streamside vegetation and marsh areas are important as hiding and thermal cover for fish. The vegetation along the edges provide escape and hiding cover for young fish and adults. The vegetation may also serve as a refugium (see Glossary) from wave action or strong currents. Higher densities of larval suckers seem to occur in pockets of open water surrounded by emergent vegetation (Stubbs & White 1993).

Shallow water areas are also important habitat. Larval and juvenile Lost River and shortnose suckers inhabit near shore waters, primarily under 20 inches in depth, throughout the summer months (Stubbs & White 1993).

Areas adjacent to a stream that exhibits the influence of flowing water are preferred by both trout and suckers. These areas maintain lower temperatures and higher dissolved oxygen and are therefore preferred over the more stagnant waters in the marsh interior. After hatching, larval suckers will emigrate from stream spawning areas back toward the main lake. During the day, the larvae will move to shallow shoreline areas in the river (Stubbs & White 1993).

The warmer, more stagnant waters of the marsh are used by warm water species, such as bass and sunfish.

When water conditions in upper Agency Lake become stressful to fish (high pH levels or low dissolved oxygen levels), usually in late summer, the fish seek out fresh water sources, such as the mouths of rivers, to better survive the stress periods. The outflow at the mouth of the Wood River and Sevenmile Creek are important areas for fish during this time of year.

Table 3 is a list of fish species known or suspected to occur in the Wood River area (John Fortune, pers. comm. 1993).

**Table 3. Fish Species of the Wood River Area**

Common Name	Scientific Name
Pacific lamprey	<i>Lampetra tridentata</i>
White sturgeon	<i>Acipenser transmontanus</i>
Brook trout	<i>Salvelinus fontinalis</i>
Brown trout	<i>Salmo trutta</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Klamath largescale sucker	<i>Catostomus snyderi</i>
Shortnose sucker	<i>Chasmistes brevirostris</i>
Lost River sucker	<i>Deltistes luxatus</i>
Blue chub	<i>Gila bicolor</i>
Tui chub	<i>Siphateles bicolor</i>
Fathead minnow	<i>Pimephales promelas</i>
Speckled dace	<i>Rhinichthys osculus</i> <i>klamathensis</i>
Brown bullhead	<i>Ictalurus nebulosus</i>
Pumpkinseed	<i>Lepomis gibbosus</i>
Largemouth bass	<i>Micropterus salmoides</i>
Yellow perch	<i>Perca flavescens</i>
Slender sculpin	<i>Cottus tenuis</i>
Klamath sculpin	<i>Cottus princeps</i>
Marbled sculpin	<i>Cottus klamathensis</i>

## Cultural Resources

Cultural resources (see Glossary) include prehistoric and historic resources, and Native American traditional use areas. Prehistoric resources are the remains of Native American occupation before contact with non-native people (approximately 1830 for the Klamath Basin). Historic resources are the remains of occupation of both native and non-native people after contact. Traditional use areas are geographic locations with cultural or religious importance to contemporary Native American groups.

Klamath people, notably the Kowa'cd'ikni (also spelled Kowa'cd'i) are suspected to have inhabited the area around the mouth of the Wood River into historic times. The Klamath Tribe oral history indicates tribal use of the area. If so, their cultural remains would likely be contained in and upon the earth surface within the Wood River property. The Wood River property is also known to contain peat bogs, and often, peat bogs adjacent to human occupation areas contain cultural remains.

To establish the presence of the Klamath people in the Wood River Ranch area, within the parameters of the archaeological and historical record, there are three basic references available.

First, Dicken and Dicken (1985) cite Peter Skene Ogden in his 1826 journal as reporting the Kowa'cd'ikni to have adopted a marine strategy (living on artificial islands). The islands, built of stone and earth and contained within wood pilings, were only accessible by canoe. Ogden's journals establish the Kowa'cd'ikni in residence at the mouth of a river, three miles from his camp (perhaps at Modoc Point). This would then place the Kowa'cd'ikni either at the mouth of the Williamson or the Wood River depending on the location of that camp. Spier (1930) cites Ogden and quotes him extensively. However, Spier omits reference 44 on the Kowa'cd'i, even though he shows their location on a map. From this, it appears that Ogden never visited the Wood River village, and that his references are of the Williamson River area and points south of there. Ogden does report contact with a small village of five huts. This could have been the Kowa'cd'ikni.

Ogden's contact with the Kowa'cd'ikni was on or about December 1, 1826 when winter food sources were very short for both the Klamaths and Ogden. Ogden reports a scarcity of game animals that forced him to butcher some of his horses for food. Ogden also reports that the Kowa'cd'ikni told him they subsisted

during winter months primarily on root crops, and in the summer principally on antelope and fish. This is consistent with winter subsistence practices throughout the Northwest, including into the ethnographic present (see Glossary). Ogden was able to trade for fish which he calls "carp," but were probably one of three types of mullet, Lost River sucker (*Deltistes luxatus*), shorthose sucker (*Chasmistes brevirostris*), or Klamath largescale sucker (*Catostomus snyderi*). All of these were found in Agency Lake and its tributaries at that point in time, but carp had not yet been introduced from China. The fish references are consistent with a marine or riverine (see Glossary) living strategy and supports the Kowa'cd'ikni at the mouth of a river. The reference to antelope is troublesome in that antelope favor wet meadow environments over wetland areas. This might make the Williamson River location the more likely site of the village than the Wood River location. Also, antelope tend to follow larger food animals such as elk, which also suggests the Williamson River area as the village site.

Second, Follansbee et al. in their 1978 Cultural Resource overview of the Jackson-Klamath Planning Unit discuss John C. Fremont's 1843 and 1846 expeditions. Fremont notes "smokes" in the marsh and villages along the rivers and lake front areas as he first traveled through the Klamath Marsh. On his return trip (around 1849), Fremont reported, in his journal, reaching Upper Klamath Lake near the spot where he turned east in 1843. He reports:

"This is a great fishing station for the Indians, and we met here the first (Klamaths) we had seen since leaving the lower valley. They have fixed habitations around the shores of the lake, particularly at the outlet and inlet up to the swamp meadow, where we met the Tlamaths in the winter of '43-'44."

Third, archaeological investigations of the Klamath River Canyon by Dr. Joanne M. Mack (1991) indicates a heavy use of riverine resources by Klamath people, especially during the winter months. Other Great Basin people often exploited riverine resources during winter months as a part of their seasonal rounds. This then gives further credibility to the Kowa'cd'ikni at a river mouth location in December.

The Klamath Tribe's Cultural Resources Coordinator furnished the following observations (1993):

"It is known among tribal members that there were village sites and scattered clusters of houses all along Wood River. There are [sic] permanent houses of families that utilized the Wood River Valley, surrounding mountains, and Agency Lake

in their seasonal round. Thus it served the central area for many economic, spiritual, and social activities. Some such areas would be discernable through archaeological methods, others would not.

The specific area of the Wood River Ranch BLM property is the most important wucus gathering area on the east side of Agency Lake. It is also a hunting area for many species of waterfowl, a fishing area, a place where duck and geese eggs are gathered, and an area for collecting the roots and plant fibers of such plants as tules and cattails."

Based on the above information, there is a high probability that cultural resources are located within the Wood River property area, and that these resources need to be surveyed, identified, and protected.

The Wood River property is regarded by the Klamath Tribe as part of their cultural heritage, however the property is located on land that was totally ceded from the Klamath Nation to the United States by the treaty of Klamath Lake in 1864. Subsequent treaties described the Klamath Indian Reservation and established the western boundary of the reservation down the centerline of the Wood River. This boundary was located in the original survey, and reestablished by Hamacker's survey around 1890.

The Klamath Tribe views the area as an integral part of their cultural landscape and assume they may guide the cultural resource management of the area. The BLM tries to accommodate the Klamath Tribe's wishes when those wishes are within the laws and regulations that guide BLM management actions.

## Visual Resources

Visual resources are the land, water, vegetation, structures and other natural features or cultural modifications that compose the scenery of BLM-administered lands. BLM-administered lands are inventoried, evaluated, and assigned an inventory class (I - IV) according to their worth from a visual resource management (VRM) perspective in order to consider visual, or scenic, resource values during management activities.

The Upper Klamath Lake watershed covers the geographic area including Upper Klamath Lake, Agency Lake, and Wood River. This watershed was inventoried as VRM inventory class II by the BLM in 1989. Although the Wood River property was not specifically

identified during this VRM inventory, it is included in this inventory class II viewshed. However, due to the highly modified condition of the property, it is currently estimated to be in a VRM inventory class IV condition.

The VRM inventory classes are used, along with other resource allocation decisions, in developing the long-term visual management objective classes for BLM-administered lands. The VRM objective classes for the Wood River property are described in Chapter 3 for each of the alternative proposals. The VRM objective class approved in the Record of Decision will provide the visual management standards for the design and development of future projects and rehabilitation of existing projects. The VRM classes are defined in the Glossary.

## **Recreation**

The major recreation activities occurring around the Wood River Ranch area are hunting, fishing, and general sightseeing (driving for pleasure, viewing scenery, wildlife observation). When the property was privately owned, there was no public access, although several adjacent property owners had access through the area. When the south half of the property was acquired by the BLM (1993) it was opened to public access but closed to motorized vehicle use for several reasons: the roads are not of a high standard and are subject to severe rutting and potholes; the potential for damage to the sensitive wetland habitat; the level of use and associated impacts is unknown; and to allow the BLM time to address other resource concerns.

When the property was in private ownership, hunting occurred, but no public hunting access existed. Now that the land is administered by the BLM, public hunting access to the south half of the Wood River property is available by foot or boat. Boat access is primarily from Petric Park, Henzel Park, private residents along Agency Lake's shores, and the upper portions of the Wood River. Petric Park, a Klamath County recreation site located approximately 1/2 mile north of the Wood River property's main gated entrance, offers boating/fishing access, picnicking, and sightseeing opportunities.

The Wood River is a popular fishing stream. It is a nationally recognized trout fishery, and managed by the Oregon Department of Fish and Wildlife as a wild trout stream. Fishing from the Wood River's banks undoubtedly occurs. Several commercial fishing guides operate in the Williamson/Sprague/Wood River area. Public and private use figures and anglers origins (local vs non-local) are unknown.

## **Wild and Scenic Rivers**

In accordance with section 5(d) of the National Wild and Scenic Rivers Act and BLM Manual 8351, the sections of Sevenmile Creek and Wood River that are adjacent to or flow through BLM-administered lands were evaluated for their eligibility to be included in the National Wild and Scenic Rivers System. Neither river was found to be eligible (neither was found to be free-flowing); therefore, they were dropped from further consideration and were not included in either the management alternatives (Chapter 3) or environmental consequences (Chapter 4). See Appendix 5 for further discussion.

## **Mineral Resources**

A private company and an individual each own 50 percent of the mineral estate. The BLM does not own any of the Wood River property mineral estate. The potential for exploration, development, and/or production of geothermal resources, natural gas, diatomite, or humates is low.

The Basin and Range physiographic province is characterized by a high rate of crustal extension accompanied by a higher-than-normal heat flow and late Tertiary-age to Quaternary-age volcanism. Rocks underlying the Wood River property are faulted and fractured permeable lava flows, breccias (see Glossary), and clastic sedimentary rocks, interbedded with impermeable altered tuffs and lacustrine (lake) sediments, that is, potential reservoir rocks; therefore, there is moderate potential for the occurrence of geothermal resources.

The upper Klamath Basin lies within the boundaries of Paleozoic- and Mesozoic-age sedimentary basins covered by thousands of feet of volcanic and volcanic-derived sedimentary rocks. It is possible that thick sequences of hydrocarbon-bearing sedimentary rock exist at depth. The U.S. Geological Survey has identified a prospect (see Glossary) for significant hydrocarbon accumulations in this area (Tennyson and Parrish 1987). There is some evidence to suggest that source rocks (see Glossary) suitable for natural gas generation could be present within the Hornbrook Formation, a sequence of Upper-Cretaceous-age marine sediments that may underlie the property. Whether volcanic activity and higher-than-normal heat flow in this area have enhanced or destroyed the

hydrocarbon potential is not known. The potential for the occurrence of gas is moderate.

Diatomite, which is dried to a fine powder and used in the manufacture of dynamite and pottery glaze, occurs in the Klamath Basin in extensive deposits of varying thickness that are interbedded with other sediments in Pliocene- and Pleistocene-Holocene-age lakebeds. Diatoms are growing today in Klamath Lake. The potential for the occurrence of accumulations of diatomite at depth is moderate.

On most of the Wood River property, there is high potential for the occurrence of peat and moderate potential for the occurrence of humates in the areas underlain by peat. Humates are used principally as soil amendments for growth stimulation. Humates, salts, or esters of humic acid are formed during the aerobic chemical and bacterial decomposition of plant material and also form as a result of the slow natural oxidation of lignite or subbituminous coal. The BLM considers peat to be a vegetative resource and humates to be a mineral resource.

## Socioeconomic Conditions

Detailed financial information regarding the revenues and expenses of the previous ranch operator is private and is not available for use by the BLM in this analysis. Public information regarding number of cattle raised, cattle weights at time of sale and sale prices, and season of use for a typical cow-calf operation was used as the BLM's estimate of current operations and future sales activities for this property under private ownership.

The current operation uses the property as summer pasture for a cow-calf operation. (Most cows and bulls are kept over the winter, but the calves, culled cows, and bulls are sold). At any one time in the summer, a total of 1,300 cow-calf pairs graze the property. In the winter the cattle are shipped to California for winter pasturing or feeding. According to Rodney Todd (OSU extension agent) this is typical for most operations in the Fort Klamath/Agency Lake area. Because the details of the current operation and how the property would be used in the future if sold to another private owner are unknown, a published estimate of a ranch budget was used to represent the cattle production of a typical cow-calf operation in the south-central region of Oregon (Hewlett, et al. 1987). The number of cattle sold and their dollar values are displayed in Table 4.

The maximum number of cattle that the property can handle, without damage occurring to the land, with its present improvements is about 1,300 head; this is 3 to 42 times larger than the operation analyzed in the estimated ranch budget. For this reason total gross sales generated by the complete operation is expected to be approximately \$377,000. Because the cattle are run on the property only half the year only half of these gross sales, approximately \$188,000, can be attributed to the property.

The section called Equalizing Tax Roles (in Chapter 1), discusses several options available to the BLM for equalizing tax impacts to Klamath County from the acquisition of the Wood River property. However, since disposal (sale or exchange) of other public lands to off-set reductions in the county tax base is a separate action from management of the Wood River property, those tax impacts will not be analyzed in this document. Analysis of those tax impacts to Klamath County will be included in the environmental analysis prepared for each sale or exchange.

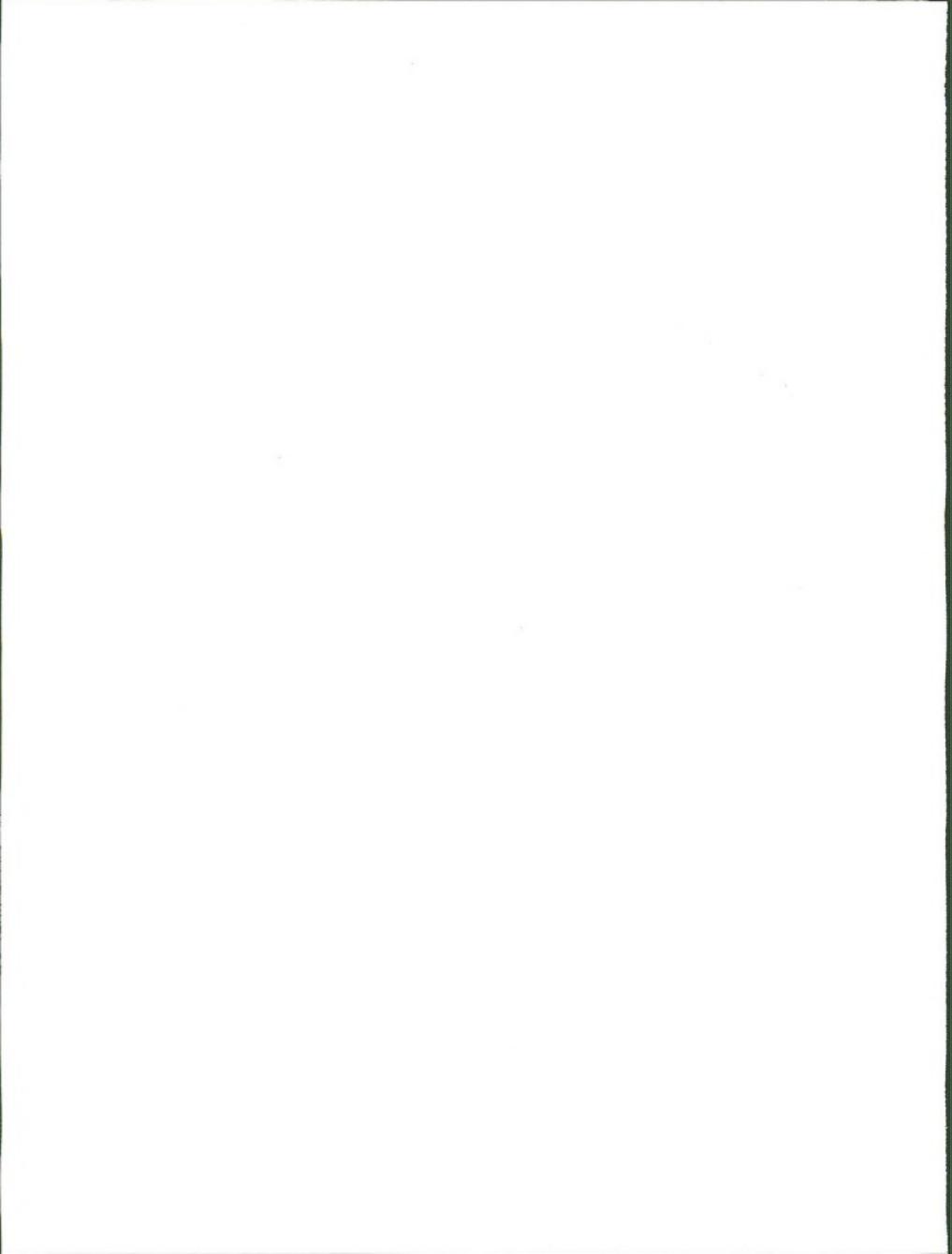
Table 4. Cow-Calf Operation, South-Central Oregon<sup>1</sup>

Product	Quantity	Weight(cwt) <sup>2</sup>	Price <sup>3</sup>	Value <sup>3</sup>
Cull Bulls	3	13.0	58.75	2,291.25
Cull Cows'	28	8.5	58.75	15,627.50
Open 1st Year Heifers	18	7.1	76.50	9,776.70
Heifer/Calfes	99	4.0	76.50	30,294.00
Steer/Calfes	151	4.5	76.50	51,981.75
Total Gross Sales				\$109,971.20

<sup>1</sup> Assumes 350 cows and 250 calves

<sup>2</sup> Per hundred pounds

<sup>3</sup> Expressed in 1989 dollars

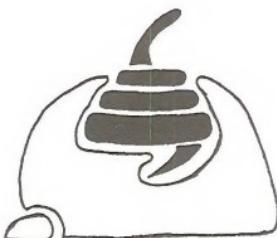


# Chapter 3

## Management Alternatives

### Table of Contents

Introduction	3-2
Alternatives Considered but Dropped from Further Analysis	3-2
Alternative A - No Action	3-3
Alternative B	3-7
Alternative C	3-14
Alternative D - The Preferred Alternative	3-19



# Introduction

This chapter explains the four alternatives that were fully considered to meet the purpose and need (described in Chapter 1) while addressing issues and concerns of the BLM, the public, and the Wood River Wetland Team (WRWT). Alternatives that were considered but dropped from further analysis are discussed first. Then the four management alternatives that were analyzed are described, starting with the alternative's objective and a summary paragraph, and followed by the management actions for each resource.

The four alternatives are: Alternative A, the No Action Alternative, which is a continuation of current management; Alternative B, which is a wetland restoration alternative that generally employs fairly simple methods that are low technology; Alternative C, which is a wetland restoration alternative that generally employs more structured and engineered technology; and Alternative D, the Preferred Alternative as chosen by the BLM with input from the WRWT, which is a combination of the other three alternatives. Management actions in these alternatives would be on BLM-administered lands and would not adversely affect adjacent landowners. Management alternatives (except Alternative A) were developed to meet the long-term goals and objectives, described in Chapter 1, for the Wood River property.

Agencies may protect resources against adverse impacts until a Record of Decision for management of an area is signed (40 CFR 1506.1[a]). Emergency protective measures were taken when the property was transferred from private to public ownership. Those measures, including closing the area to unauthorized motor vehicle use, to overnight use, and to fires of any kind, which were published in the Federal Register in July 1993 and clarified in January 1994, would be the difference between management of the property when under private ownership and current (BLM) management as analyzed in Alternative A.

## Alternatives Considered but Dropped from Further Analysis

During the study process, various alternatives and management actions were considered but eliminated

from detailed study. These alternatives failed to meet the purpose and need as described in Chapter 1, were not technically feasible, could not be implemented, were not considered legally permissible, or did not appear to have much, if any, public support.

An alternative that proposed to increase the amount of grazing was considered and dismissed because it was outside the reasonable range of management actions/alternatives that would fit under the purpose of improving water quality and restoring wetlands on the property.

An alternative that consisted of only natural processes, such as eliminating dikes, prohibiting grazing, not regulating water with pumps, no road improvements, etc., was considered and dismissed. Potentially, much of the property would be submerged to such a depth that vegetation could not be reestablished on a large portion of the property. This alternative would likely not have much, if any, public support, nor would it meet the intent for management of the property.

Another alternative that proposed to incorporate low to moderate grazing use, a wide range of research projects, and moderate to intense developed recreation facilities was considered but eliminated from detailed study because it was felt that the range of actions covered in Alternatives A, B, and C adequately addressed the actions in this alternative.

Also considered but eliminated from further consideration was an "experiment station" alternative. Under this alternative, the primary objective would be to conduct research on various wetland conversion methods, and on the effects these methods would have on water quality, quantity, and other variables. The entire parcel of land would be divided into cells or compartments for conducting various research projects. Upon completion of each project, its compartment would be modified to meet the needs of the next proposed project. This alternative was dropped from detailed study because it is inconsistent with the long-term goals described in Chapter 1.

The final alternative that was considered was one in which no change in management would occur from when the property was under private ownership. This alternative was eliminated from further consideration because it was so similar to Alternative A (the No Action, or Continuation of Existing Management Direction Alternative), and certain elements of it would not be implementable by the BLM due to the BLM's public land management responsibilities, as dictated in the Federal Land Policy and Management Act, and other laws, policies, and regulations.

# Alternative A - No Action, Continuation of Existing Management Direction

Alternative A, referred to as the No Action Alternative, can be better described as a continuation of current management direction from the time of the BLM's purchase of the Wood River property and is a required alternative under the National Environmental Policy Act (NEPA) of 1976, as amended (40 CFR1502.14[d]). Some actions are different than those occurring when the property was in private ownership because of laws, policies, and manuals that the BLM must follow when managing public lands; however, as previously stated, the No Action Alternative is basically the same as what would have occurred under private ownership, except for some minor resource protection measures. This alternative should not be misinterpreted to be an alternative where the BLM does no active management, which would be illegal under the BLM's organic act, the Federal Land Policy and Management Act.

## Objective

To maintain the current use of the property as predominantly for livestock grazing in an irrigated pasture.

Current management direction on the Wood River property would be continued under Alternative A. Livestock grazing would remain at current levels. Water would be pumped off in the spring at current schedules (see Chapter 2, Water Resources). The amounts of upland, wet meadow, and marsh habitat would remain constant. Recreation resources would be managed for minimum use levels.

## Air Resources

Monitoring of air quality would be conducted as required by regulation and peer practice to meet the goals of the Federal Clear Air Act, as amended; the Oregon Implementation Plan; and the Oregon Smoke Management Plan.

## Water Resources

Water quality studies currently in progress would be completed. Water quality monitoring (see Appendix 3) would be conducted in accordance with BLM and

national and local guidelines and priorities. Cooperation with other agencies in the sharing of data would continue. The irrigation system would continue to be operated similarly to its present operation (described in Chapter 2, Affected Environment).

## Wetlands

Livestock grazing would not occur in the Wood River Marsh or riparian areas, unless necessary for resource manipulation. The remainder of the property would remain as reclaimed wetlands and would be grazed by livestock. Periodic dredging of Wood River would continue. The riparian area adjacent to the Wood River would be monitored periodically to determine if the current condition is being maintained or improved. Exchange-of-use agreements with adjacent ranchers to encourage water quality enhancement on privately owned land would be considered.

## Soil Resources

No specific management actions to mitigate soil degradation would be designed.

## Visual Resources

The property would be managed to meet Visual Resource Management (VRM) Class IV objectives, which would be to allow management activities that require major modification of the natural character of the landscape (BLM Manual Handbook H-8431-1). Under VRM Class IV management, the level of change to the landscape can be high and management activities may dominate the view and be the major focus of viewer attention.

## Special Status Species Habitat

If any special status species (federally or state listed as threatened or endangered, federally proposed as threatened or endangered, category 1 and 2 federal candidate, and Bureau sensitive) are suspected in an area proposed for a management activity, field surveys would focus on those species. If populations of these species were found, then their habitats would be protected through modification of management actions as appropriate to eliminate adverse impacts to federally listed or proposed species and to not contribute to the need to list category 1 and 2 federal candidate, state listed, or Bureau sensitive species.

If a project could not be altered to eliminate a potential effect on a federally listed or proposed threatened or

endangered species, then consultation with the U.S. Fish and Wildlife Service would be initiated, as required under section 7 of the Endangered Species Act. For state listed and state proposed species, the BLM would coordinate with the appropriate state agency to develop policies that would assist the state in achieving its management objectives for those species.

**Fish and Wildlife.** No specific management actions, beyond the required actions mentioned in the previous paragraphs, would occur.

**Plants.** Inventories would be conducted if appropriate habitat is identified and/or if funding is available. Although very little is known about the precise habitat requirements of Applegate's milkvetch (*Astragalus applegatei*), the loam soils on the northern third of the Wood River property may be habitat for this federally endangered plant species. A portion of the property would be inventoried for Applegate's milkvetch.

## **Fish and Wildlife Habitat**

Riparian zones would be protected from grazing. A grazing system could be established to provide a healthy pasture/meadow habitat.

## **Recreation**

The area would be closed to motorized vehicles and to overnight use. No campfires, fireworks, or smoking would be permitted. Hunting, fishing, sightseeing, and wildlife viewing would be allowed. Hunting and fishing use would be monitored and coordinated with the Oregon Department of Fish and Wildlife (ODFW) to develop and adjust hunting and fishing policies. Non-motorized recreation opportunities would be provided. Minimal recreation facilities (such as picnic tables, portable toilet, etc.) could be provided for protection of resource values, public safety, and health. See Map 2.

## **Special Areas**

According to BLM Manual 1613.2, areas recommended internally (within the BLM) or externally (members of the public or of other agencies) for consideration as an area of critical environmental concern (ACEC) must be evaluated by the BLM. The Wood River property was recommended for consideration and therefore was evaluated for designation as an ACEC. (See Appendix 4 for the relevance and importance criteria and evaluation process). The Wood River property would not be designated an ACEC under this alternative because it is not consistent with the intent of Alternative A.

## **Cultural Resources**

A class 1 inventory would be conducted on the property. A class 1 inventory is a comprehensive literature search to determine the existence of cultural remains within the project area. A class 3 survey, which is an intensive survey of the ground to identify and record all cultural resource sites within a specific location, would be completed prior to commencing any surface-disturbing activities.

Consultation with the Klamath Tribe would occur during the monthly BLM/Klamath Tribe meetings on cultural resources, and at other times, if deemed necessary. This consultation would include updates on existing projects and discussion on new projects anticipated on the Wood River property. Consensus would be sought on all projects.

## **Roads and Facilities**

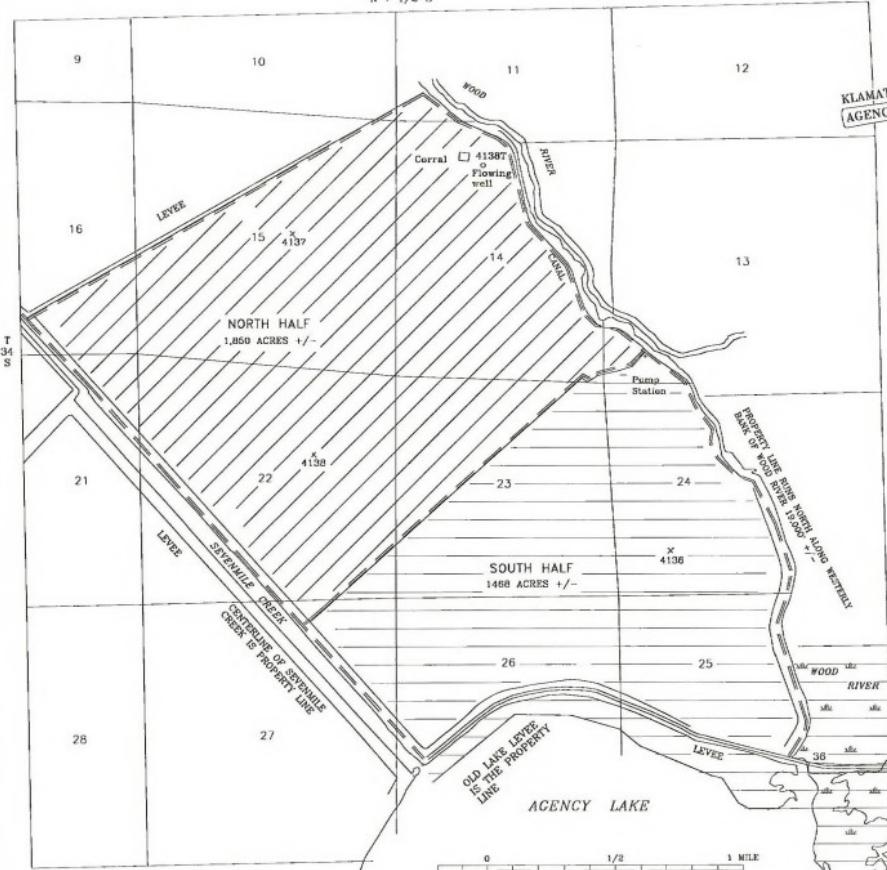
Existing easements (see Glossary) with adjacent property owners would be recognized and the BLM would follow the terms and conditions of those easements. The Wood River property would remain closed to motorized vehicles, except for those people with administrative access or easements. Dike roads would be maintained but not improved. Periodic maintenance of major dikes, especially the southern dike adjacent to Agency Lake, would be conducted to preserve the integrity of the dike. The bridge over Wood River would be inspected and maintained according to BLM bridge maintenance schedules (BLM Manual 9112.4).

Existing facilities, including cattle guards, fences, gates, ditches, pumps, pump house, bunkhouse shack, corral, and livestock handling facilities (corral) would be maintained to sustain the current livestock operation (see Map 2).

## **Mineral and Energy Resources**

Although the potential for the occurrence of natural gas, geothermal resources, humates, and diatomite is moderate, the potential for mineral activity is considered to be low. If the mineral estate was acquired in the future, the area would be withdrawn from (closed to) locatable mineral entry under the general mining laws and would be subject to a "no surface occupancy" stipulation for mineral and energy leases. The "no surface occupancy" stipulation could be waived if it was demonstrated that the mineral activity was consistent with other management goals. Mineral or energy activity also would be subject to other federal

R 7 1/2 E



MAP 2  
WOOD RIVER WETLAND  
Alternative A  
(No Action)

LEGEND

NORTH HALF OF PROPERTY



SOUTH HALF OF PROPERTY



KLAMATH  
AGENCY

M.P.1



0 1/2 1 MILE  
1000 0 1000 2000 3000 4000 5000 FEET

and state regulations, such as the Clean Air Act, Clean Water Act, Endangered Species Act, etc.

## Livestock Grazing

Under this alternative, livestock grazing would remain as outlined in Chapter 2 (Affected Environment), as directed by the Klamath Falls Resource Management Plan (RMP), and as required by BLM regulation, policy, and guidance. Up to 1,300 head/pairs of cattle would be grazed on the property between approximately May 1 and November 30 each year, up to a maximum of 7,200 animal unit months (see Glossary). Cattle use would be rotated between the various "ditch-defined" pastures as determined necessary and prudent by the grazing lessee and the BLM. All or most of the pastures on the property would be expected to be grazed at some time during the grazing season. Livestock use along the Wood River and Sevenmile Creek riparian area and in the Wood River Marsh would be prohibited unless necessary for resource manipulation purposes. Existing cattle-guards, fence, ditches, gates, and livestock handling facilities would be maintained or enhanced to sustain the current livestock operations.

An allotment management plan outlining specific grazing formulas and systems, specific locations of

individual projects, schedules for management actions, monitoring methods and schedules, and other actions necessary for proper grazing management would be included in the Record of Decision for this environmental impact statement.

The Wood River allotment would be initially categorized as an "I", or improve, category allotment under this alternative. The purpose of this selective categorization is to prioritize allotments so as to direct management efforts and funding to the areas or allotments with the greatest need and/or opportunities. The "I" category allotments receive the most management attention, followed by "M", or maintain, allotments and, lastly, the "C", or custodial, category allotments. The 1992 Klamath Falls Resource Area Draft Resource Management Plan/Environmental Impact Statement (RMP/EIS) and the Klamath Falls Resource Area Proposed RMP/Final EIS, to be published in 1994, have further explanations of the allotment categorization (selective management) process. These plans also provide resource area specific information and direction on management of the grazing program, including how future adjustments in grazing management will be implemented, as well as general allowable use and condition objectives, and the rangeland monitoring and evaluation processes. Direction from these plans would apply to the Wood River property.



Existing facilities on the Wood River property.

Photo by: Ron Hicks

## Fire Management

An initial attack agreement for suppression of wildfires would be established with the Winema National Forest, U.S. Fish and Wildlife Service, and/or the Oregon Department of Forestry.

## Noxious Weed Management

Federal agencies are directed to control noxious weeds on federal lands by the Carlson-Foley Act (Public Law [PL] 90-583) and the Federal Noxious Weed Act of 1974 (PL 93-629). Noxious weed management on the Wood River property would be part of an integrated noxious weed management program as described in the Integrated Weed Control Plan and Environmental Assessment for the Klamath Falls Resource Area (OR-014-93-09). An appropriate combination of manual, mechanical, chemical, and biological methods would be used to control noxious weed species. Any herbicide use would be in accordance with the program design features outlined in the Integrated Weed Control Plan.

All chemical and some mechanical treatments for noxious weeds would be accomplished through a contract with Klamath County, if populations of these species are identified for control. Appropriate herbicides would be used for treatment of noxious weeds in wetlands. Biological control organisms are supplied and/or distributed by the Oregon Department of Agriculture (ODA) through a memorandum of understanding between the ODA and the BLM's Oregon State Office.

## Alternative B

### Objective

To restore the Wood River property to a functioning wetland with diverse plant communities and healthy, productive vegetation.

The majority of the Wood River property would be restored to a functioning wetland consistent with the long-term goals described in Chapter 1. Under this alternative, initial management actions could require highly engineered techniques, such as restoring the Wood River and Sevenmile Creek to their historic meandering channels; however, in the long term, wetland restoration systems and methods would be designed for minimum maintenance using the existing landscape features (such as topography) and natural energies (such as stream flows) of the property.

Vegetation management (including water level fluctuations, livestock grazing, fire, and mechanical manipulation) would be used to develop diversity in plant communities and to maintain healthy and productive vegetation. The amounts of upland habitat would decrease, while wetland habitat, such as wet meadows and marshes would increase. Recreation resources would be managed for moderate use levels.

## Air Resources

Monitoring of air quality would be conducted as required by regulation and peer practice to meet the goals of the Federal Clean Air Act, as amended; the Oregon Implementation Plan; and the Oregon Smoke Management Plan. Earthwork would be conducted so that dust production would be minimized.

## Water Resources

Improvement in water quality entering Agency and Klamath lakes would be through changes in current management practices and passive filtration. The BLM would cooperate in studies to determine the effectiveness of the wetland system in improving water quality and storage (see Appendix 6). The current irrigation system would be used to manipulate water levels and/or soil moisture conditions to maintain the wetland habitat. The majority of the property would be restored to approximately pre-development conditions to the extent that it wouldn't adversely impact adjacent landowners.

The exact techniques used for wetland restoration have not been finalized pending additional data collection, such as a detailed topographic survey; however, several likely restoration scenarios are summarized in Table 5 (see Appendix 7 for a more detailed description). Actual wetland restoration methods probably would not vary significantly from methods described in this document. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing stream channel or wetland restoration projects.

**Stream Channel Restoration Options.** Wood River and Sevenmile Creek would be restored to approximate their condition prior to dredging and channelization. This restoration would only occur within BLM-administered lands. Stream channel restoration methods could include one or more of the options shown in Table 5.

**Table 5. Summary of Stream Channel and Wetland Restoration Options**

Option	Description	Alternatives			
		A	B	C	D
<b>STREAM CHANNEL RESTORATION OPTIONS</b>					
1	Restore the Wood River by establishing a meandering flow pattern in the Wood River Marsh (outside the dike from the main property's interior). This would include dredging channels within the existing marsh to be consistent with the historic meandering pattern shown on old aerial photos. Fill from dredging would be placed in the existing dredged channel. The existing levees would be maintained.	X	X	X	X
2	Restore wetland by establishing a meandering flow pattern for Sevenmile Creek through the main property's interior. Because of flow levels in Sevenmile Creek, flow control structures would probably be installed at the northwest corner of the property, the northwest corner of the south half of the property, and in the central interior dike. Low flows would tend to be confined to channels, whereas high flows would likely flood the area. Fish passage and extent of habitat that is accessible to fish would be maximized.	X		X	
3	Restore wetland by establishing a meandering flow pattern for Wood River through the main property's interior. Because of flow levels in Wood River, flow control structures would probably be installed at the northeast corner of the property, the northeast corner of the south half of the property, and in the central interior dike. Low flows would tend to be confined to channels, whereas high flows would likely flood the area. Fish passage and extent of habitat that is accessible to fish would be maximized.	X		X	

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Table 5. Summary of Stream Channel and Wetland Restoration Options (continued)

Option	Description	Alternatives			
		A	B	C	D
<b>WETLAND RESTORATION OPTIONS</b>					
1	Restore wetland by operating the existing canal and pump system. The wetland could be both restored and maintained by manipulating water levels with the existing system. Water levels could be manipulated to enhance habitat and wetland vegetation for certain species.	X	X	X	X
2	Restore wetland by re-establishing the lake-wetland interface (opening the property's interior to prevailing water levels in Agency Lake). This could be accomplished by installing pipes or culverts through the dike along the north shore of Agency Lake, allowing lake water passage between the lake and the south half of the property. Culverts or other water-control structures could also be installed in the east and west dikes, and in the interior containment dike separating the north and south halves of the property. This would allow for movement of fish, wildlife, and plant species between Agency Lake, Wood River, Sevenmile Creek, and the main property, as well as restoring wetland habitat to the majority of the Wood River parcel.	X	X	X	X
3	Restore wetland supported by inflows from Sevenmile Creek (no pre-defined path) and outflow to Agency Lake. The water would flow through the restored wetland (main property's interior) without a predefined path and would be subject to existing site topography. No channels would be created. Existing canals could either be filled with dirt or left open, depending on anticipated interaction with flows. Because of flow levels in Sevenmile Creek, flow control structures would probably be installed at the northwest corner of the property, the northwest corner of the south half of the property, and in the central interior dike.		X		

**Table 5. Summary of Stream Channel and Wetland Restoration Options (continued)**

Option	Description	Alternatives			
		A	B	C	D
<b>WETLAND RESTORATION OPTIONS (CONTINUED)</b>					
4	Restore wetland supported by inflows from Wood River (no pre-defined path) and outflow to Agency Lake. The water would flow through the restored wetland (main property's interior) without a predefined path and would be subject to existing site topography. No channels would be created. Existing canals could either be filled by dirt or left open, depending on anticipated interaction with flows. Because of flow levels in Wood River, flow control structures would probably be installed at the northeast corner of the property, the northeast corner of the south half of the property, and in the central interior dike.		X		
5	Construct and operate small pilot study areas, primarily to refine design details and operating procedures necessary to proceed with intensive wetland restoration and water quality improvement projects on the Wood River property or on other lands. The number and extent of these pilot studies could vary spatially and temporally. These pilot studies would address essential feasibility and design-relation questions relating to intensive or passive water quality treatment and wetland restoration. It is expected that, due to research and implementation schedules, a significant portion of the property could be included in pilot study areas for at least five to ten years.			X	
6	Establish a wetland system/water quality treatment system that is designed to provide the specific flow distribution, retention time, and contact characteristics (vegetation/water contact) that enhance water treatment performance. These characteristics are discussed in Appendix 6. The system design would include construction of internal berms and water controls to induce desired hydrodynamic attributes. The wetland treatment system would be operated during specified times to improve the quality of water entering Agency Lake or to intercept incoming nutrients at critical times (generally, during the summer months when water quality in the lake system declines). This intensive water quality treatment system could ultimately be converted in the long term to a restored wetland that is self sustaining.			X	

**Wetland Restoration Options.** The majority of the Wood River property would be restored to a functioning wetland. Wetland restoration systems and methods would be designed for minimum maintenance using the existing landscape features (such as the topography), natural energies (such as stream flows), and vegetation manipulation (including water level fluctuations, mechanical manipulation, livestock grazing, and prescribed burning). Limited plantings of riparian and wetland vegetation would occur, using native and naturally-occurring species. For example, native tree and brush species would be planted along dikes in clumps to stabilize them and provide bird habitat.

Methods to restore the main property's interior to wetland could include one or more of the options shown in Table 5.

Any of these options could be used for the north half, the south half, or the entire Wood River property. One or more of these methods could be used in conjunction with one or more of the stream restoration methods; however, some methods would be mutually exclusive of other methods.

## Soil Resources

Management activities would be designed and monitored to ensure that undue degradation of soils would not occur. Studies to determine the potential of peat and peaty soils as pollutant and nutrient filters would be encouraged.

## Visual Resources

The property would be managed to meet Visual Resource Management (VRM) Class II objectives, which is to retain the natural character of the landscape, which is a wetland. Changes in any of the basic elements (form, line, color, texture) caused by a management activity should be low. Contrasts are seen, but must not attract attention of the casual observer. Changes must repeat the basic elements found in the predominant natural features of the characteristic landscape. Projects or management actions would be evaluated using the BLM's contrast rating system to measure the degree of contrast between the proposed activity and the natural features of the landscape, and would meet or exceed VRM Class II objectives (BLM Manual Handbook H-8431-1).

## Special Status Species Habitat

If any special status species (federally or state listed as threatened or endangered, federally proposed as

threatened or endangered, category 1 and 2 federal candidate, and Bureau sensitive) are suspected in an area proposed for a management activity, field surveys would focus on those species. If populations of these species were found, then their habitats would be protected through modification of management actions as appropriate to eliminate adverse impacts to federally listed or proposed species and to not contribute to the need to list category 1 and 2 federal candidate, state listed, or Bureau sensitive species.

If a project could not be altered to eliminate a potential effect on a federally listed or proposed threatened or endangered species, and abandonment of the project was not considered feasible, then consultation with the U.S. Fish and Wildlife Service would be initiated under section 7 of the Endangered Species Act.

For state listed and state proposed species, the BLM would coordinate with the appropriate state agency to develop policies that would assist the state in achieving its management objectives for those species.

**Fish and Wildlife.** Specific management actions for special status species habitat under Alternative B can be found in the Water Resources and Fish and Wildlife Habitat sections.

**Plants.** Inventories would be conducted if appropriate habitat is identified and/or if funding is available. Although very little is known about the precise habitat requirements of Applegate's milkvetch (*Astragalus applegatei*), the loam soils on the northern third of the Wood River property may be habitat for this federally endangered plant species. A portion of the property would be inventoried for Applegate's milkvetch.

## Fish and Wildlife Habitat

Native tree species would be planted in clumps along major dikes for cover and future nest and perch sites, as well as to mitigate dike erosion. Portions of levees would be planted with native shrubs to provide nesting and roosting areas for neotropical migrant birds. Vegetative management (using natural water fluctuations, livestock grazing, prescribed fires, mechanical manipulation, or other methods) could be used to create diversity and edge effects within the wetland.

River meanders would be recreated to improve fisheries habitat. Riparian habitat along the Wood River and Sevenmile Creek would be restored and maintained. Large, woody structure (trees) would be placed in and along river and creek banks to provide cover for fish. Channel morphology and substrate would be studied as they relate to factors limiting fish production, and modified as necessary.

## **Recreation**

Roaded natural experience opportunities (opportunities to have a high degree of interaction with the natural environment) would be provided. Recreation resources would be managed for moderate use levels. Hunting, fishing, sightseeing, wildlife viewing, and other recreation uses would be supported by providing facilities and on-the-ground personnel. Such facilities include, but are not limited to, two improved (graveled or paved) parking areas (minimum 1/4 acre each, for a maximum of 1 acre total), improved roads to the parking areas, toilets, interpretive signing, nature trails (canoe, foot, mountain bike, horseback, and/or ski trails), a boat ramp to access Wood River Marsh, and a visitor center with observation tower. Facilities would be provided for user convenience, safety, and resource protection. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing recreation facilities. Map 3 shows the locations of the improved roads, parking lots, and boat ramp.

The property would be closed to overnight use. No campfires, fireworks, or smoking would be permitted. Off-highway vehicles would be limited to improved roads, which under this alternative would be the east dike road along Wood River approximately up to the mid-way point of the property near the pump station, and the south dike road to the intersection with the east (Sevenmile Creek) dike road. Other roads would be closed to motorized vehicles, except those with administrative access or easements.

Hunting and fishing use would be monitored and coordinated with the Oregon Department of Fish and Wildlife (ODFW) to develop and adjust hunting and fishing policies. Shooting would be prohibited in designated safety zones, which would be established for user safety and wildlife viewing. Jet boats and air boats would be prohibited in wetland areas. Limits on speed and wakes would be coordinated with the Oregon State Marine Board and could be recommended to mitigate environmental degradation. The area would be identified as a Watchable Wildlife site in cooperation with the ODFW.

## **Special Areas**

The Wood River property was evaluated for designation as an area of critical environmental concern (ACEC) and was found to meet the relevance and importance criteria as described in Appendix 4. Under this alternative the Wood River property would be designated an

ACEC. The approved Upper Klamath Basin Resource Management Plan/Record of Decision would serve as the activity-level plan for the area.

## **Cultural Resources**

A class 1 inventory would be conducted on the property. A class 1 inventory is a comprehensive literature search to determine the existence of cultural remains within the project area. A class 3 survey, which is an intensive survey of the ground to identify and record all cultural resource sites within a specific location, would be completed prior to commencing any surface-disturbing activities. An archaeologist (from the BLM and/or Klamath Tribe) would be on-site during these activities to monitor the site. Testing for artifacts could be done, based on surface or stream bank indicators.

Consultation with the Klamath Tribe would occur during the monthly BLM/Klamath Tribe meetings on cultural resources, and at other times, if deemed necessary. This consultation would include updates on existing projects and discussion on new projects anticipated on the Wood River property. Consensus would be sought on all projects.

## **Roads and Facilities**

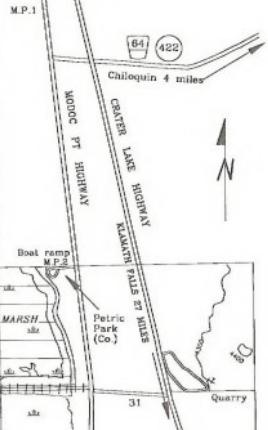
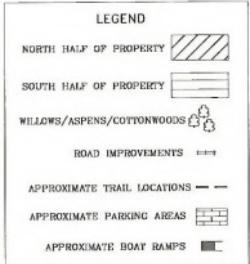
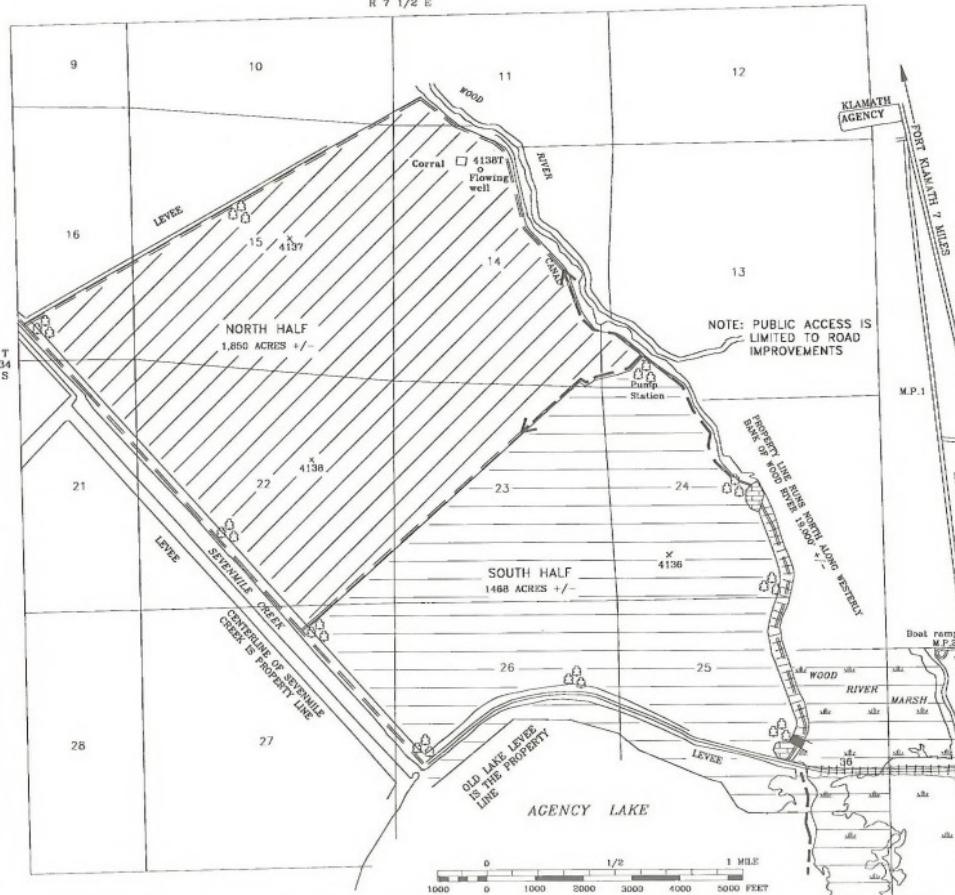
Existing easements with adjacent property owners would be recognized and the BLM would follow the terms and conditions of those easements. Roads could be improved (graveled or paved), consistent with overall objectives of this alternative. Motorized vehicle use would be limited to improved roads, which under this alternative would be the south dike road along Agency Lake, and approximately one mile of the east dike road along Wood River (see Map 3). Other roads would be closed to motorized vehicles, except those with administrative access or easements. Periodic maintenance of major dikes, especially the southern dike adjacent to Agency Lake, would be conducted to preserve the integrity of the dike. The bridge over Wood River would be inspected and maintained according to BLM bridge maintenance schedules (BLM Manual 9112.4).

If necessary to be consistent with overall management objectives of Alternative B, existing facilities, including cattle guards, fences, gates, ditches, bunkhouse shack, corral, and livestock handling facilities could be removed and disposed of in accordance with BLM property procedures (BLM Manual 1527.2 and 1533.2). The pumps and pump house would be maintained, and improved if necessary.

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U.S. Department of the Interior  
Bureau of Land Management  
Lakeview District  
Klamath Falls Resource Area

MAP 3  
WOOD RIVER WETLAND  
Alternative B  
WETLAND RESTORATION



## Mineral and Energy Resources

Although the potential for the occurrence of natural gas, geothermal resources, humates, and diatomite is moderate, the potential for mineral activity is considered to be low. If the mineral estate was acquired in the future, the area would be withdrawn from (closed to) locatable mineral entry under the general mining laws and would be subject to a "no surface occupancy" stipulation for mineral and energy leases. The "no surface occupancy" stipulation could be waived if it was demonstrated that the mineral activity was consistent with other management goals. Mineral or energy activity also would be subject to other federal and state regulations, such as the Clean Air Act, Clean Water Act, Endangered Species Act, etc.

## Livestock Grazing

Under this alternative, livestock grazing would be used solely as a management tool to support the primary goal of wetland restoration. Levels and duration of grazing, as well as maintenance and construction of range improvement projects, would be dependent on the need to meet management objectives. It is expected that the amount of grazing would be significantly less than that allowed under Alternative A, and it is possible that no grazing would occur. Any livestock use would be authorized and allowed via a competitive bid contract for the purposes of vegetative management. In lieu of or in addition to livestock grazing, haying of portions of the property would be considered as an alternative if vegetative removal was necessary to meet the wetland restoration goals. The allotment would be initially categorized as an "M", or maintain, category allotment under this alternative. The same planning (RMP/EIS) constraints and direction listed under Alternative A would also apply to this alternative.

## Fire Management

An initial attack agreement for suppression of wildfires would be established with the Winema National Forest, U.S. Fish and Wildlife Service, and/or the Oregon Department of Forestry. Parameters would be developed under which fire could be introduced as an ecosystem process to achieve resource management objectives. Prescribed burning could be implemented through planned ignition. To mitigate air quality problems, all burning would be conducted during unstable atmospheric conditions and with favorable transport winds.

## Noxious Weed Management

Federal agencies are directed to control noxious weeds on federal lands by the Carlson-Foley Act (Public Law [PL] 90-583) and the Federal Noxious Weed Act of 1974 (PL 93-629). Noxious weed management on the Wood River property would be part of an integrated noxious weed management program as described in the Integrated Weed Control Plan and Environmental Assessment (EA) for the Klamath Falls Resource Area (OR-014-93-09). An appropriate combination of manual, mechanical, chemical, and biological methods would be used to control noxious weed species. Any herbicide use would be in accordance with the program design features outlined in the KFRA Integrated Weed Control Plan and EA.

All chemical and some mechanical treatments for noxious weeds would be accomplished through a contract with Klamath County, if populations of these species are identified for control. Appropriate herbicides would be used for treatment of noxious weeds in wetlands. Biological control organisms are supplied and/or distributed by the Oregon Department of Agriculture (ODA) through a memorandum of understanding between the ODA and the BLM's Oregon State Office.

## Alternative C

### Objective

To restore the Wood River property to a functioning wetland with diverse plant communities and healthy, productive vegetation.

The majority of the Wood River property would be restored to a functioning wetland consistent with the long-term goals described in Chapter 1. Under this alternative, both initial and long-term wetland restoration could involve highly engineered techniques, complex designs, experimental methods, and/or pilot projects. The intent of these systems would be to improve water quality entering Agency Lake. When a system was developed with acceptable performance, the entire parcel could be converted to that system design. Research would figure more prominently in this alternative, and would encompass both the methods used for wetland restoration and the effects that restoration had on water quality and quantity, fish and wildlife habitat, and other relevant parameters. Vegetation management (including water level and

flow fluctuations, livestock grazing, fire, and chemical and mechanical manipulation) would be used to develop desired plant communities. Shallow water wetland habitat would be emphasized. Recreation resources would be managed for high use levels, and would emphasize education and interpretation.

## Air Resources

Monitoring of air quality would be conducted as required by regulation and peer practice to meet the goals of the Federal Clean Air Act, as amended; the Oregon Implementation Plan; and the Oregon Smoke Management Plan. Earthwork would be conducted so that dust production would be minimized.

## Water Resources

Wetland restoration resulting in maximum water quality treatment would be emphasized (see Appendix 6). After initial experimentation, the most effective pilot projects (as determined by the Wood River Wetland Team) could be chosen for long-term implementation on most or all of the Wood River parcel. The majority of the property would be restored to approximately pre-development conditions to the extent that it wouldn't adversely impact adjacent landowners.

The exact techniques used for wetland restoration have not been finalized pending additional data collection, such as a detailed topographic survey; however, several likely restoration scenarios are summarized here (see Appendix 7 for a more detailed description). Actual wetland restoration methods probably would not vary significantly from methods described in this document. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing stream channel or wetland restoration projects.

**Stream Channel Restoration Options.** The proposed method for stream channel restoration is shown in Table 5.

**Wetland Restoration Options.** The majority of the Wood River property would be restored to a functioning wetland. Wetland restoration systems would be designed and constructed using established and newly developed methods and could involve highly engineered techniques, complex designs, experimental methods, and/or pilot projects. Vegetation manipulation could include water level fluctuations, mechanical and chemical manipulation, livestock grazing, and prescribed burning. Plantings and seedlings of various

riparian and wetland plants (using native and naturally-occurring species) would occur as needed to support research and water quality improvement and, if compatible, to allow for aquaculture. Studies and restoration projects applicable to private land management could be pursued to promote water quality improvement programs on private lands. Methods to restore the main property's interior to wetland could include one or more of the options shown in Table 5.

These options could be used for the north half, the south half, or the entire Wood River property.

## Soil Resources

Management activities would be designed and monitored to ensure that undue degradation of soils would not occur. Studies to determine the engineering properties of the soils on site could occur as needed to support construction of treatment facilities.

## Visual Resources

The property would be managed to meet Visual Resource Management (VRM) Class III objectives, which is to partially retain the natural character of the landscape, which is a wetland. Changes in any of the basic elements (form, line, color, texture) caused by a management activity can be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Projects or management actions would be evaluated using the BLM's contrast rating system to measure the degree of contrast between the proposed activity and the natural features of the landscape, and would meet or exceed VRM Class II objectives (BLM Manual Handbook H-8431-1).

## Special Status Species Habitat

If any special status species (federally or state listed as threatened or endangered, federally proposed as threatened or endangered, category 1 and 2 federal candidate, and Bureau sensitive) are suspected in an area proposed for a management activity, field surveys would focus on those species. If populations of these species were found, then their habitats would be protected through modification of management actions as appropriate to eliminate adverse impacts to federally listed or proposed species and to not contribute to the need to list category 1 and 2 federal candidate, state listed, or Bureau sensitive species.

If a project could not be altered to eliminate a potential effect on a federally listed or proposed threatened or endangered species, then consultation with the U.S. Fish and Wildlife Service would be initiated under section 7 of the Endangered Species Act.

For state listed and state proposed species, the BLM would coordinate with the appropriate state agency to develop policies that would assist the state in achieving its management objectives for those species.

**Fish and Wildlife.** Habitat for special status species could be improved/created. For example, mid-sized sedge habitat would benefit yellow rails; creation of pool habitat (18 to 24 inches in depth) may enhance spotted frog habitat. Pole perches would be installed in newly created wetland areas for bald eagle and other raptor hunting perches.

Management actions proposed for fish habitat improvement (see Fish and Wildlife Habitat) would also benefit endangered suckers. Additional management actions for special status species habitat can be found in the Water Resources and Fish and Wildlife Habitat sections.

**Plants.** Inventories would be conducted if appropriate habitat is identified and/or if funding is available. Although very little is known about the precise habitat requirements of Applegate's milkvetch (*Astragalus applegatei*), the loam soils on the northern third of the Wood River property may be habitat for this federally endangered plant species. A portion of the property would be inventoried for Applegate's milkvetch.

## **Fish and Wildlife Habitat**

Native tree species would be planted in clumps along major dikes for cover and future nest and perch sites, as well as to mitigate erosion of the dikes. Wildlife habitat could be improved or created, for example managing for tall grasses/sedges in uplands for early migrants such as geese and shorebirds; creating shrub fence rows along portions of levees for neotropical migrant bird nesting and roosting habitat; and placing nest structures for waterfowl, bluebird, and sandhill cranes. Vegetative management (such as fires, natural water fluctuations, and livestock grazing) could be used to create diversity and edge effects within the marsh.

Wood River's historic meanders could be restored in the Wood River Marsh to provide more fish habitat (see Water Resources section for more details). Riparian habitat along the Wood River and Sevenmile Creek would be restored and maintained. Large,

woody structures (trees), and/or artificial structures (such as debris piles) would be placed along river and creek banks to provide cover for fish. Channel morphology and substrate would be studied as they relate to factors limiting fish production, and modified as necessary.

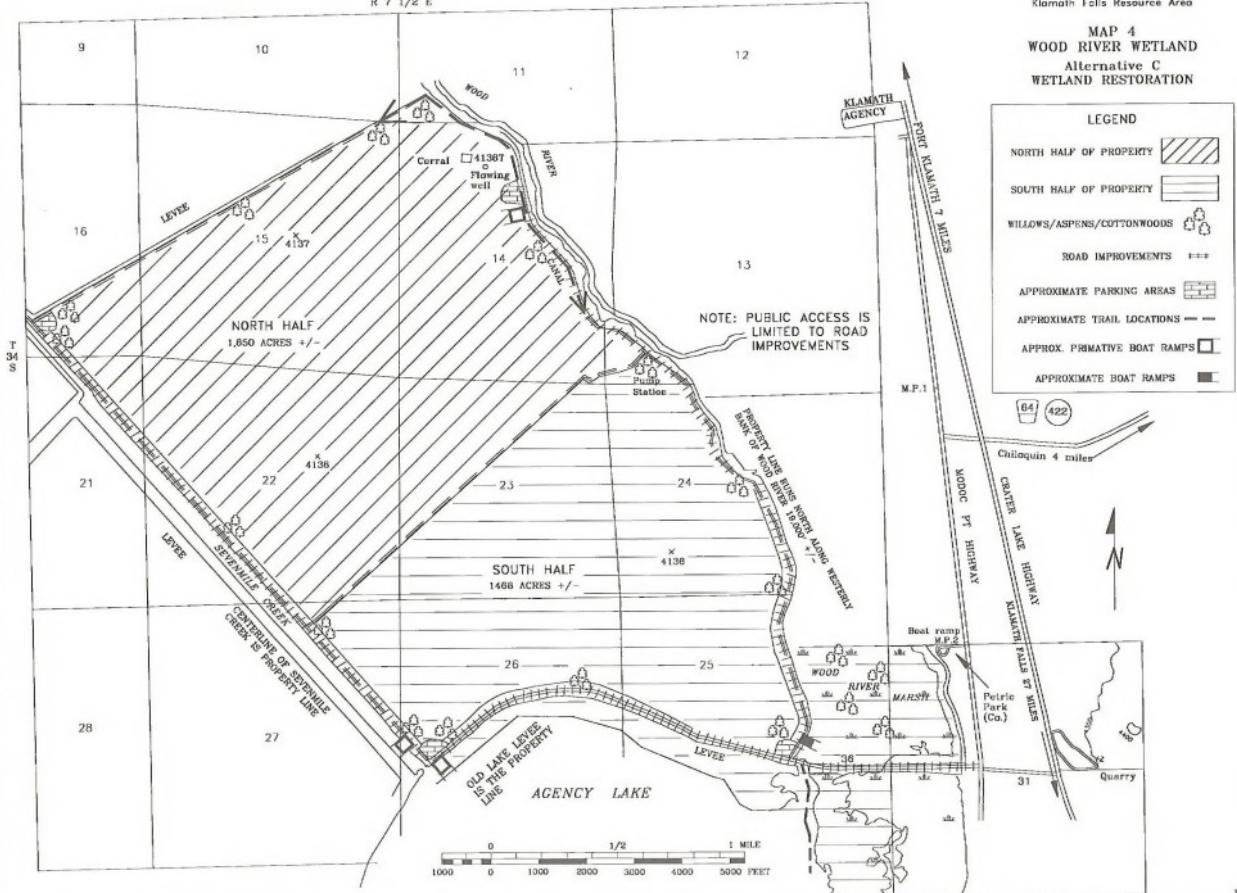
## **Recreation**

Rural recreation experience opportunities (opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities) would be provided. Recreation resources would be managed for high use levels, with emphasis on education and interpretation of wetland restoration processes. Hunting, fishing, sightseeing, wildlife viewing, and other recreation uses would be supported by providing facilities and on-the-ground personnel. Facilities would be designed for wetland restoration educational purposes for moderate to high use by individuals and groups. The greatest investment in recreation facilities would occur under this alternative, and could include up to four gravelized or paved parking areas (see Map 4); gravelized or paved roads along Agency Lake, Wood River, and Sevenmile Creek; toilets at one or more parking areas; interpretive signing and trail networks (canoe, foot, mountain bike, horseback and/or ski trails) where deemed appropriate; up to four boat ramps to access Wood River, the Wood River Marsh, Agency Lake, and Sevenmile Creek; and an interpretive facility/observation tower. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing recreation facilities.

The property would be closed to overnight use. No campfires, fireworks, or smoking would be permitted. Off-highway vehicles would be limited to improved roads, which under this alternative would be the south, east, and west dike roads. The north dike road would be closed to motorized vehicles, except those with administrative access or easements.

Hunting and fishing use would be monitored and coordinated with the Oregon Department of Fish and Wildlife (ODFW) to develop and adjust hunting and fishing policies. Hunting and fishing could be limited more under this alternative than under the other alternatives, depending on locations and types of wetland restoration projects. Shooting would be prohibited in designated safety zones, which would be established for user safety and wildlife viewing. In the future, boat access could be provided to the main property. Air boats and jet boats would be prohibited

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MAP 4  
WOOD RIVER WETLAND  
Alternative C  
WETLAND RESTORATION

LEGEND

- NORTH HALF OF PROPERTY
- SOUTH HALF OF PROPERTY
- WILLOWS/ASPENS/COTTONWOODS
- ROAD IMPROVEMENTS
- APPROXIMATE PARKING AREAS
- APPROXIMATE TRAIL LOCATIONS
- APPROX PRIMITIVE BOAT RAMPS
- APPROXIMATE BOAT RAMPS

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422

Chiloquin 4 miles

Old River

Lake

Highway

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in the wetland areas. No other limits on motorized boats would be imposed. The area would be identified as a Watchable Wildlife site in cooperation with the ODFW.

## **Special Areas**

The Wood River property was evaluated for designation as an area of critical environmental concern (ACEC) and was found to meet the relevance and importance criteria as described in Appendix 4. Under this alternative, the Wood River property would be designated an ACEC. The approved Upper Klamath Basin Resource Management Plan/Record of Decision would serve as the activity-level plan for the area.

## **Cultural Resources**

A class 1 inventory would be conducted on the property. A class 1 inventory is a comprehensive literature search to determine the existence of cultural remains within the project area. A class 3 survey, which is an intensive survey of the ground to identify and record all cultural resource sites within a specific location, would be completed prior to commencing any surface-disturbing activities. An archaeologist (from the BLM and/or Klamath Tribe) would be on-site during these activities to monitor the site. Testing for artifacts could be done, based on surface or stream bank indicators.

Consultation with the Klamath Tribe would occur during the monthly BLM\Klamath Tribe meetings on cultural resources, and at other times, if deemed necessary. This consultation would include updates on existing projects and discussion on new projects anticipated on the Wood River property. Consensus would be sought on all projects.

## **Roads and Facilities**

Existing easements with adjacent property owners would be recognized and the BLM would follow the terms and conditions of those easements. Roads could be improved (graveled or paved) to facilitate access to the entire parcel for wetland restoration projects and recreation uses. Motorized vehicle use would be limited to improved roads, which under this alternative would be the south (Agency Lake), east (Wood River), and west (Sevenmile Creek) dike roads (see Map 4). The dike road on the northern property boundary would be closed to motorized vehicles, except those with administrative access or easements. Periodic maintenance of major dikes, especially the southern dike adjacent to Agency Lake, would be conducted to preserve the integrity of the dike. The bridge over Wood River would be inspected and

maintained according to BLM bridge maintenance schedules (BLM Manual 9112.4).

If necessary to be consistent with overall management objectives of Alternative C, existing facilities, including cattle guards, fences, gates, ditches, bunkhouse shack, corral, and livestock handling facilities could be removed and disposed of in accordance with BLM property procedures (BLM Manual 1527.2 and 1533.2). The pumps and pump house would be maintained, and improved if necessary (see Map 4).

## **Mineral and Energy Resources**

Although the potential for the occurrence of natural gas, geothermal resources, humates, and diatomite is moderate, the potential for mineral activity is considered to be low. If the mineral estate was acquired in the future, the area would be withdrawn from (closed to) locatable mineral entry under the general mining laws and would be subject to a "no surface occupancy" stipulation for mineral and energy leases. The "no surface occupancy" stipulation could be waived if it was demonstrated that the mineral activity was consistent with other management goals. Mineral or energy activity also would be subject to other federal and state regulations, such as the Clean Air Act, Clean Water Act, Endangered Species Act, etc.

## **Livestock Grazing**

Under this alternative, livestock grazing would be used solely as a management tool to support the primary goal of wetland restoration. Levels and duration of grazing, as well as maintenance and construction of range improvements, would be dependent on the need to meet management objectives. It is expected that the amount of grazing would be significantly less than that allowed under Alternative A, and it is possible that no grazing would occur. Any livestock use would be authorized and allowed via a competitive bid contract for the purposes of vegetative management. In lieu of or in addition to livestock grazing, haying of portions of the property would be considered as an alternative if vegetative removal was necessary to meet the wetland restoration goals. The allotment would be initially categorized as an "M", or maintain, category allotment under this alternative. The same planning (RMP/EIS) constraints and direction listed under Alternative A would also apply to this alternative.

## **Fire Management**

An initial attack agreement for suppression of wildfires would be established with the Winema National Forest, U.S. Fish and Wildlife Service, and/or the

Oregon Department of Forestry. Parameters would be developed under which fire could be introduced as a tool to achieve objectives of particular projects.

Prescribed burning could be implemented through planned ignition on projects where the design includes fire. To mitigate air quality problems, all burning would be conducted during unstable atmospheric conditions and with favorable transport winds.

## Noxious Weed Management

Federal agencies are directed to control noxious weeds on federal lands by the Carlson-Foley Act (Public Law [PL] 90-583) and the Federal Noxious Weed Act of 1974 (PL 93-629). Noxious weed management on the Wood River property would be part of an integrated noxious weed management program as described in the Integrated Weed Control Plan and Environmental Assessment (EA) for the Klamath Falls Resource Area (OR-014-93-09). An appropriate combination of manual, mechanical, chemical, and biological methods would be used to control noxious weed species. Any herbicide use would be in accordance with the program design features outlined in the KFRA Integrated Weed Control Plan and EA.

All chemical and some mechanical treatments for noxious weeds would be accomplished through a contract with Klamath County, if population of these species are identified for control. Appropriate herbicides would be used for treatment of noxious weeds in wetlands. Biological control organisms are supplied and/or distributed by the Oregon Department of Agriculture (ODA) through a memorandum of understanding between the ODA and the BLM's Oregon State Office.

# Alternative D - The Preferred Alternative

## Objective

To restore the Wood River property to its previous form and function of a wetland community, within unalterable constraints (such as existing dikes, water rights, land ownership patterns, and funds). Long-term improvements in water quality entering Agency Lake would be a goal; however, localized decreases in water quality could occur in the short term. Improving and increasing wetland habitat for

federally listed suckers and for waterfowl would be emphasized. Labor-intensive, highly engineered wetland restoration methods using complex designs would be allowed; however, the preference would be to use wetland restoration systems and methods that were designed with less labor-intensive practices using the existing landscape features (such as topography) and natural energies (such as stream flows) of the property. Pilot studies would be allowed. Adaptive management, the process of changing land management as a result of monitoring or research, would be used. Recreation resources would be managed for moderate use levels.

## Air Resources

**Objective:** To meet the goals of the Federal Clean Air Act, as amended; the Oregon Implementation Plan; the Oregon Smoke Management Plan; and to prevent the deterioration of air quality within the Klamath Falls Special Protection Zone (described in the Oregon Smoke Management Plan).

Monitoring of air quality would be conducted as required by regulation and peer practice. Emissions of fugitive dust and smoke would be limited to operations associated with maintenance and restoration activities.

## Water Resources

**Objective:** To improve the quality and quantity of water entering Agency Lake.

The majority of the property would be restored to approximate pre-development conditions to the extent that it wouldn't adversely impact adjacent landowners. Improvement in water quality entering Agency and Klamath Lakes would be through changes in current management practices and passive filtration. The current irrigation system could be used or modified to manipulate water levels and/or soil moisture conditions to maintain a functioning wetland. The BLM would cooperate in studies to determine the effectiveness of the wetland system(s) in improving water quality and storage. The BLM would comply with all applicable Oregon State water laws and cooperate with the Meadows Drainage District in its operation and use of the Wood River property's irrigation system.

The exact techniques used for wetland restoration have not been finalized pending additional data collection, such as a detailed topographic survey; however, several likely restoration scenarios are summarized in Table 5 (see Appendix 7 for a more detailed description). Actual wetland restoration methods probably would not vary significantly from

methods described in this document. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing stream channel or wetland restoration projects.

### **Stream Channel Restoration Options**

**Objective:** To restore Wood River and Sevenmile Creek to approximate their historic meandering flow patterns prior to dredging. This restoration would only occur within BLM-administered lands, would be consistent with Oregon State water laws, and would not adversely affect water use or rights of other landowners.

Stream channel restoration methods could include one or more of the options shown in Table 5.

Restoration of the Wood River channel would be a higher priority than restoration of Sevenmile Creek, and therefore, would be pursued first. Overland sheet flows from Wood River and Sevenmile Creek could be established in the short term or the long term while the stream dechannelization and other restoration methods were occurring.

### **Wetland Restoration Options**

**Objective:** To restore the majority of the Wood River property to a functioning wetland community, including restoration of the historic vegetation community. Vegetation management could occur using several methods, including but not limited to water level fluctuations, livestock grazing, haying, planting and seeding, prescribed fire, and mechanical or chemical methods. Vegetation manipulation would be used to develop species diversity and to maintain healthy and productive stands of native riparian and wetland vegetation. One or two small-scale, reversible pilot projects could be constructed to provide additional information on effects on water quality, effects on wetland habitat, or for research purposes; however these projects would only take up a small (approximately one acre) portion of the property, unlike the pilot projects under Alternative C, which could include a majority of the property.

Methods to restore the main property's interior to wetland could include one or more of the options shown in Table 5.

Many of these options could be used for the north half, the south half, or the entire Wood River property.



Source for Irrigation from Wood River

Photo by: Ron Hicks

Some of the methods would be compatible with other methods, while some methods could preclude other methods.

## Soil Resources

**Objective:** To ensure that undue degradation of soils would not occur.

Management activities would be designed and monitored to meet the soils objective. Studies that determine the potential of peat and peaty soils as pollutant and nutrient filters would be encouraged.

## Visual Resources

**Objective:** To ensure management actions meet VRM Class II objectives.

The property would be managed to meet Visual Resource Management (VRM) Class II objectives, which is to retain the natural character of the landscape, which is a wetland. Changes in any of the basic elements (form, line, color, texture) caused by a management activity should be low. Contrasts are seen, but must not attract attention of the casual observer. Changes must repeat the basic elements found in the predominant natural features of the characteristic landscape. Projects or management actions would be evaluated using the BLM's contrast rating system to measure the degree of contrast between the proposed activity and the natural features of the landscape, and would meet or exceed VRM Class II objectives (BLM Manual Handbook H-8431-1).

## Special Status Species Habitat

**Objective:** To protect habitats of federally listed or proposed threatened or endangered species; to avoid contributing to the need to list category 1 and 2 federal candidate, state listed, and Bureau sensitive species; to emphasize management of special status species including a complete inventory for these animals (for example spotted frog); and to maintain a diversity of habitats to meet or exceed viable population levels.

Management of special status species habitats would also be consistent with the Klamath Falls Resource Area's proposed RMP/Final EIS. If any special status species (federally or state listed as threatened or endangered, federally proposed as threatened or endangered, category 1 and 2 federal candidate, and Bureau sensitive) are suspected in an area proposed for a management activity, field surveys would focus on those species. If populations of these species were

found, then the plants or animals and their habitats would be protected through modification of management actions as appropriate to eliminate impacts to federally listed or proposed species and to not contribute to the need to list category 1 and 2 federal candidate, state listed, or Bureau sensitive species.

If a project could not be altered to eliminate a potential effect on a federally listed or proposed threatened or endangered species, then consultation with the U.S. Fish and Wildlife Service would be initiated under section 7 of the Endangered Species Act.

For state listed and state proposed species, the BLM would coordinate with the appropriate state agency to develop policies that would assist the state in achieving its management objectives for those species.

**Fish and Wildlife.** Management actions for listed sucker species would include placing natural structures in and along river and creek banks, and restoring Wood River and Sevenmile Creek to be consistent with historic meander patterns (see Water Resources section in this chapter for further details). Additional management actions for special status species habitat can be found in the Fish and Wildlife Habitat sections.

**Plants.** Inventories would be conducted if appropriate habitat is identified and/or if funding is available. Although very little is known about the precise habitat requirements of Applegate's milkvetch (*Astragalus applegatei*), the loamy soils on the northern third of the Wood River property may be habitat for this federally endangered plant species. A portion of the property would be inventoried for Applegate's milkvetch. Under section 7 of the Endangered Species Act, consultation with the Oregon Department of Agriculture would be pursued regarding management activities with potentially adverse effects on a listed or proposed plant species.

## Fish and Wildlife Habitat

**Objective:** To improve spawning and rearing conditions for suckers and salmonids; to improve habitat for raptors and neotropical migratory birds; and to optimize waterfowl habitat within the constraints of other resource objectives.

Native tree species would be planted in clumps along major dikes for cover and future nest and perch sites, as well as to mitigate dike erosion. Portions of levees would be planted with native shrubs to provide nesting and roosting areas for neotropical migrant birds. Vegetative management (using water fluctuations, livestock grazing, prescribed fires, mechanical or

chemical manipulation, or other methods) could be used to create habitat diversity and edge effects within the wetland. Riparian habitat along the Wood River and Sevenmile Creek would be restored and maintained by planting riparian vegetation and protection from grazing. River meanders would be recreated to improve fisheries habitat. Habitat structures (trees or large boulders) would be placed in and along river and creek banks to provide cover for fish. Channel morphology and substrate would be studied as they relate to factors limiting fish production, and would be modified as necessary.

Nest islands and/or upland areas could be developed for waterfowl nesting.

## **Recreation**

**Objective:** To provide opportunities for roaded natural recreation experiences (opportunities to have a high degree of interaction with the natural environment); to manage the area for low to moderate recreation use levels (moderate near developed sites and roads, and low to moderate in other areas) and for day use only; and to designate the area as the Wood River Special Recreation Management Area (SRMA).

Recreation use and facilities would be secondary to the overall objective of wetland restoration and water quality improvement. Because this property has been in private ownership and the specific level and location of wetland restoration projects is unknown, the intensity of anticipated recreation use is unknown. Therefore, rather than assume a particular level of recreation use and provide facilities based on that assumption, use levels would be monitored and when a pattern is determined, then recreation facilities appropriate to those levels would be designed and provided. These facilities would meet the roaded natural recreation experience opportunity objective (See Alternative B Recreation section for a brief description of these objectives).

In addition to use levels, the BLM would consider user convenience, safety, and resource protection when determining what recreation facilities to provide. Such facilities could include, but are not limited to, improved (graveled or paved) parking areas and roads, toilets, interpretive signing, nature trails (canoe, foot, mountain bike, horseback, and/or ski trails), boat ramps to access Wood River and Sevenmile Creek, and a rustic visitor center with observation tower. A likely recreation development scenario would include improved roads to parking area(s) and boat ramp(s) on the south dike to access the Wood River and/or Sevenmile

Creek, and an improved road and large (1 acre) parking area and visitor center on the west (Wood River) dike road (see Map 5). Toilets and nature trails would be provided at one or more locations. The BLM would coordinate construction activities with the Oregon Department of Environmental Quality, US Fish and Wildlife Service, and the Army Corps of Engineers (among others) when designing and constructing recreation facilities.

The area would be closed to overnight use. No campfires, fireworks, or smoking would be permitted. Off-highway vehicles would be limited to designated, signed roads (this would also include seasonal closures), as determined by use levels and needs.

The location and type of facilities, as well as which roads will be open or closed to motorized vehicles, would be developed in a future recreation plan. This plan would be developed after recreation use levels are established and the design and location of stream and wetland restoration projects are defined. Temporary facilities, such as parking areas, boat ramps, and toilets may be developed prior to development of the recreation plan. Because of the increased recreation management and investment, the area would be identified as a special recreation management area, as required in BLM Manual 1623.

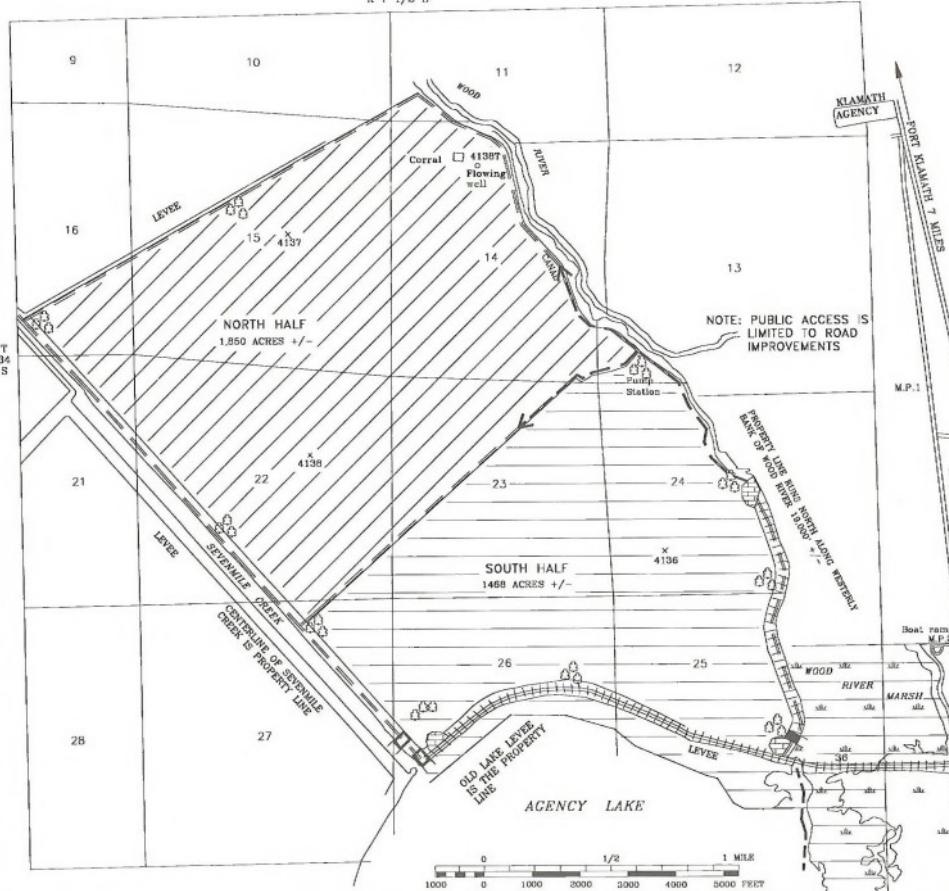
Hunting, fishing, sightseeing, and wildlife viewing would be supported by providing facilities. Hunting and fishing use would be monitored and coordinated with the Oregon Department of Fish and Wildlife (ODFW); hunting and fishing policies would be developed and/or adjusted based on results of the monitoring data. Safety zones would be established for user safety and wildlife viewing, shooting would be prohibited in these zones. Jet boats and air boats would be prohibited in the existing Wood River Marsh and in other wetland areas as they are constructed. Limits on speed and wakes would be coordinated with the Oregon State Marine Board and could be recommended to mitigate environmental degradation. The area would be identified as a Watchable Wildlife site in cooperation with the ODFW.

## **Special Areas**

**Objective:** To manage the area as an area of critical environmental concern (ACEC); and to protect the area's relevant and important values, which are cultural, fish, and wildlife values, and natural processes and systems.

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U.S. Department of the Interior  
Bureau of Land Management  
Lickview District  
Klamath Falls Resource Area



MAP 5  
WOOD RIVER WETLAND  
Alternative D  
WETLAND RESTORATION  
(Preferred Alternative)

LEGEND

- NORTH HALF OF PROPERTY
- SOUTH HALF OF PROPERTY
- WILLOWS/ASPENS/COTTONWOODS
- ROAD IMPROVEMENTS
- APPROXIMATE TRAIL LOCATIONS
- APPROXIMATE PARKING AREAS
- APPROX. PRIMITIVE BOAT RAMPS
- APPROXIMATE BOAT RAMPS

The Wood River property was evaluated for designation as an ACEC and found to meet the relevance and importance criteria and evaluation process as described in Appendix 4. The Wood River property would be designated an ACEC. The approved Upper Klamath Basin Resource Management Plan/Record of Decision would serve as the activity-level plan for the area.

## Cultural Resources

**Objective:** To protect known cultural resources (including both historic and prehistoric resources).

A class 1 inventory would be conducted on the property. A class 1 inventory is a comprehensive literature search to determine the existence of cultural remains within the project area. A class 3 survey, which is an intensive survey of the ground to identify and record all cultural resource sites within a specific location, would be completed prior to commencing any surface-disturbing activities. An archaeologist (from the BLM and/or Klamath Tribe) would be on-site during these activities to monitor the site. Testing for artifacts could be done, based on surface or stream bank indicators.

Consultation with the Klamath Tribe would occur during the monthly BLM/Klamath Tribe meetings on cultural resources, and at other times, if deemed necessary. This consultation would include updates on existing projects and discussion on new projects anticipated on the Wood River property. Consensus would be sought on all projects.

## Roads and Facilities

**Objective:** To provide adequate roads and facilities (quality and quantity) to support management objectives.

Existing easements with adjacent property owners would be recognized and the BLM would follow the terms and conditions of those easements. Roads could be improved (graveled or paved), consistent with overall objectives of this alternative and as determined by use levels and needs. Motorized vehicle use would be limited to improved, designated, and signed roads (this could also include seasonal closures) (see Map 5). Exceptions to this would be for people with administrative access or existing easements. Dike maintenance (such as rip-rapping, and planting trees and shrubs) would be accomplished to provide safety to vehicle users and to maintain the integrity of the dikes. The bridge over Wood River would be inspected and maintained according to BLM bridge maintenance schedules (BLM Manual 9112.4). If necessary to be consistent with overall management objectives of Alternative D, existing facilities, including cattle guards, fences, gates, ditches, bunkhouse shack, corral, and livestock handling facilities could be removed and disposed of in accordance with BLM property procedures (BLM Manual 1527.2 and 1533.2). The pumps and pump house would be maintained, and improved if necessary (see Map 5).



Wood River Channel

Photo by: Ron Hicks

## Mineral and Energy Resources

**Objective:** To pursue acquisition of mineral estate, if the opportunity arises, and to ensure mineral activity did not conflict with other management goals. If the mineral estate remains in private ownership, the objective would be to work with the private owner to prevent mineral activity from conflicting with other management goals, to the extent possible.

Although the potential for the occurrence of natural gas, geothermal resources, humates, and diatomite is moderate, the potential for mineral activity is considered to be low. If the mineral estate was acquired in the future, the area would be withdrawn from (closed to) locatable mineral entry under the general mining laws and would be subject to a "no surface occupancy" stipulation for mineral and energy leases. The "no surface occupancy" stipulation could be waived if it was demonstrated that the mineral activity was consistent with other management goals. Mineral or energy activity also would be subject to other federal and state regulations, such as the Clean Air Act, Clean Water Act, Endangered Species Act, etc.

## Livestock Grazing

**Objective:** To use livestock grazing as a management tool to support the primary goal of wetland restoration, if and where appropriate.

Under this alternative, livestock grazing would be used solely as a management tool to support the primary goal of wetland restoration. Levels and duration of grazing, as well as maintenance and construction of range improvement projects, would be dependent on the need to meet management objectives. It is expected that the amount of grazing would be significantly less than that allowed under Alternative A, and it is possible that no grazing would occur. Any livestock use would be authorized and allowed via a competitive bid contract for the purposes of vegetative management. In lieu of or in addition to livestock grazing, haying of portions of the property would be considered as an alternative if vegetative removal was necessary to meet the wetland restoration goals. The allotment would be initially categorized as an "M", or maintain, category allotment under this alternative. The same planning (RMP/EIS) constraints and direction listed under Alternative A would also apply to this alternative.

## Fire Management

**Objective:** To suppress all wildfires, and to reintroduce fire as an ecosystem process by using prescribed

burning as a management tool to support the primary goal of wetland restoration.

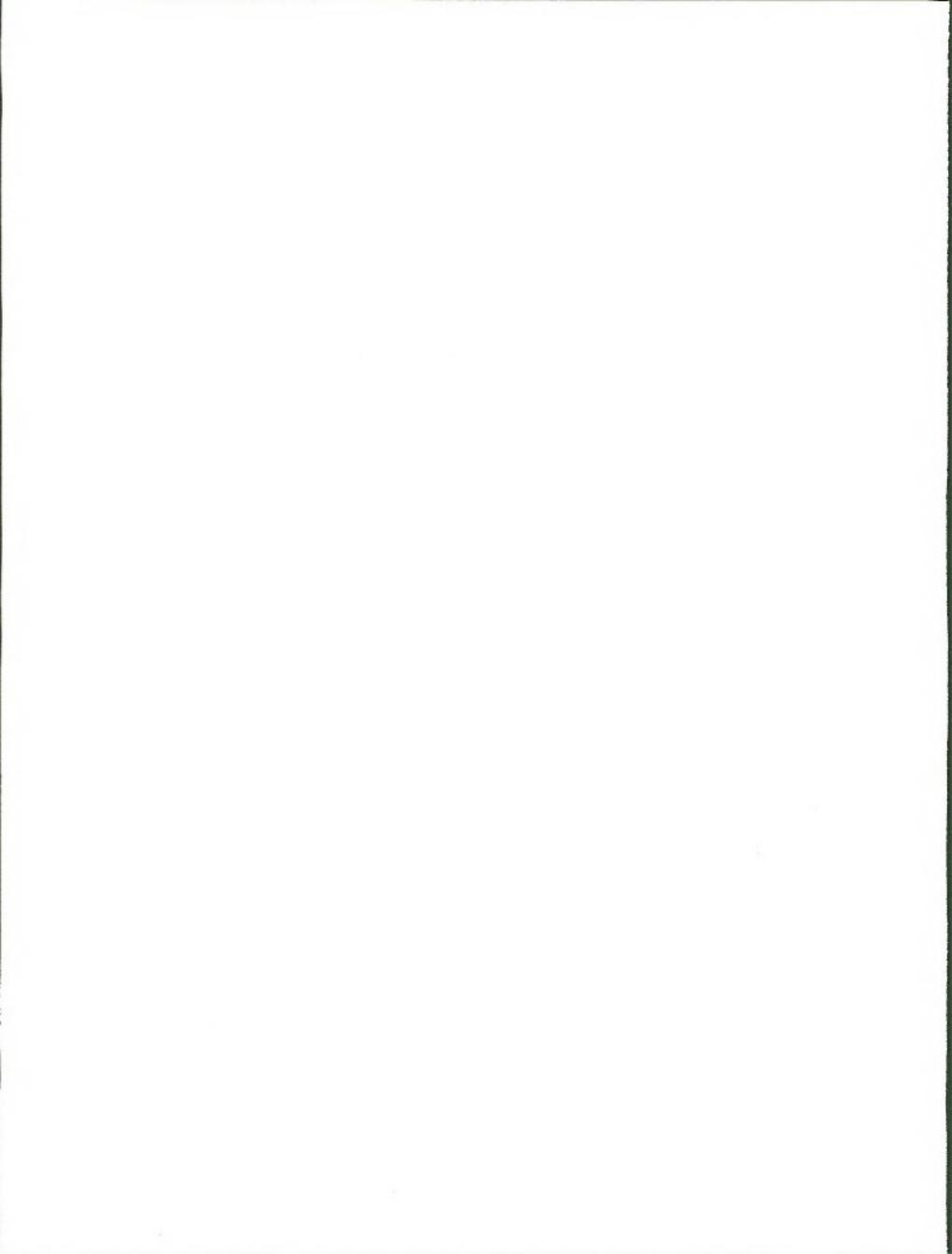
An initial attack agreement for suppression of wildfires would be established with the Winema National Forest, U.S. Fish and Wildlife Service, and/or the Oregon Department of Forestry. Parameters would be developed under which fire could be introduced as an ecosystem process to achieve resource management objectives. Prescribed burning could be implemented through planned ignition, as determined by wetland restoration methods; by meeting the other objectives of improving water quality and quantity, and restoring wetland habitat for endangered suckers and waterfowl; and to further research objectives. To mitigate air quality problems, all burning would be conducted during unstable atmospheric conditions and with favorable transport winds.

## Noxious Weed Management

**Objective:** To manage noxious weed species to facilitate restoration and maintenance of desirable plant communities and healthy watersheds; to prevent introduction, reproduction, and spread of noxious weeds into and within the resource area; and to manage existing populations of noxious weeds to levels that minimize the negative impacts of noxious weed invasions.

Federal agencies are directed to control noxious weeds on federal lands by the Carlson-Foley Act (Public Law [PL] 90-583) and the Federal Noxious Weed Act of 1974 (PL 93-629). Noxious weed management on the Wood River property would be part of an integrated noxious weed management program as described in the Integrated Weed Control Plan and Environmental Assessment (EA) for the Klamath Falls Resource Area (OR-014-93-09). An appropriate combination of manual, mechanical, chemical, and biological methods, and water level manipulation would be used to control noxious weed species. Seasonal timing would be considered in any control program. Herbicide use would be in accordance with the program design features outlined in the KFRA Integrated Weed Control Plan and EA.

All chemical and some mechanical treatments for noxious weeds would be accomplished through a contract with Klamath County or other appropriate agencies, if populations of these species are identified for control. Appropriate herbicides would be used for treatment of noxious weeds in wetlands. Biological control organisms are supplied and/or distributed by the Oregon Department of Agriculture (ODA) through a memorandum of understanding between the ODA and the BLM's Oregon State Office.



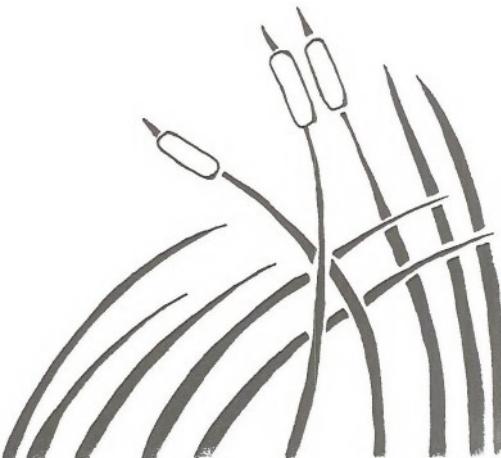
# Chapter 4

# Environmental

# Consequences

## Table of Contents

Introduction	4-2
Assumptions Used in the Alternatives	4-2
Environmental Consequences	4-2
Effects on Air Quality	4-2
Effects on Water Resources	4-4
Effects on Wetlands	4-7
Effects on Soil Resources	4-9
Effects on Vegetation	4-9
Effects on Fish and Wildlife Habitat	4-13
Effects on Special Status Species	4-17
Habitat	
Effects on Recreation	4-17
Effects on Visual Resources	4-19
Effects on Cultural Resources	4-19
Effects on Livestock Grazing	4-20
Effects on Noxious Weed Management	4-21
Effects on Socioeconomic Conditions	4-21



# Introduction

In this chapter, the positive and negative environmental consequences (effects) of implementing the alternatives described in Chapter 3 are defined. The effects of continuing the current management direction (Alternative A) on each resource on BLM-administered land are discussed and compared to effects of implementing the other alternatives. Unlike Chapter 3, this chapter is organized by resource. Each resource discussion begins with assumptions and is followed by effects of each alternative. If the effects are similar for more than one alternative, the discussion is lumped (such as for Alternatives B and D), rather than repeated for each alternative.

Knowledge about the physical, biological, and socio-economic relationships discussed in this chapter is not complete, especially when referring to effects from wetland restoration. Because of this and the lack of quantifiable data, most of the effects are not quantified, but rather are described relative to the effects from continuation of existing management direction (Alternative A, No Action). For example, the water quality would continue to deteriorate under Alternative A, but would improve under Alternatives B, C, and D, with the most improvement under Alternative C.

Direct, indirect, and cumulative effects are all considered in each resource analysis, to the extent possible. *Direct effects* result from activities or management actions that are planned or authorized by the BLM under each alternative. *Indirect effects* generally occur when the public takes advantage of opportunities provided by BLM management; examples include hunting, fishing, and other recreational activity, as well as effects on socioeconomic conditions. *Cumulative effects* are those resulting from combined activities on both BLM-administered lands and on other lands, both public and private.

The National Environmental Policy Act requires environmental impact statements to address short-term uses and long-term productivity, irreversible or irretrievable commitments of resources, and unavoidable adverse impacts. These topics are addressed, where relevant, in this chapter. Both short- and long-term time frames were considered. Unless otherwise specified, short term is assumed to be less than ten years, and long term is greater than ten years.

Preliminary analysis, including scoping, indicates that the alternatives would not significantly affect the following: mineral and energy resources, timber resources, paleontological values, wilderness areas,

rural interface areas, or wild and scenic rivers; therefore, those topics are not included in this chapter.

## Assumptions Used in the Alternatives

Funding and personnel would be sufficient to implement any alternative described.

Monitoring (see Appendix 3) would be completed as indicated and adjustments or revisions would be made as appropriate.

Alternative A would result in the least surface disturbance from project construction and the most effects from livestock grazing, while Alternative C would have the most surface disturbance from project construction. The types of surface-disturbing activities expected include stream channel and wetland restoration projects, mechanical and chemical vegetation manipulation, road and dike maintenance and improvements, and construction of recreation facilities.

A summary of stream channel and wetland restoration options for each alternative is included in Table 6 to assist the reader while reading the effects from the various options. Table 5 in Chapter 3 and Appendix 7 describe the options more fully.

Other assumptions are listed at the beginning of each resource section.

## Environmental Consequences

### Effects on Air Quality

#### Assumptions

The major sources of air pollutants associated with BLM resource management on the Wood River property would be smoke from prescribed fire (levels of which have not yet been determined), and fugitive dust associated with road use, construction and maintenance activities, and other surface-disturbing activities. Fugitive dust from road use or earth-moving activities normally settles within a short distance from the point of origin. Preventive measures, such as maintaining moisture in the excavated material and quickly vegetating exposed soils, reduce fugitive dust. Negative

**Table 6. Summary of Stream Channel and Wetland Restoration Options**

Option	Description	Alternatives		
		A	B	C
<b>STREAM CHANNEL RESTORATION OPTIONS</b>				
1	Restore the Wood River by establishing a meandering flow pattern in the Wood River Marsh (outside the dike from the main property's interior).	X	X	X
2	Restore wetland by establishing a meandering flow pattern for Sevenmile Creek through the main property's interior.	X		X
3	Restore wetland by establishing a meandering flow pattern for Wood River through the main property's interior.	X		X
<b>WETLAND RESTORATION OPTIONS</b>				
1	Restore wetland by operating the existing canal and pump system.	X	X	X
2	Restore wetland by re-establishing the lake-wetland interface (opening the property's interior to prevailing water levels in Agency Lake).	X	X	X
3	Restore wetland supported by inflows from Sevenmile Creek (no pre-defined path) and outflow to Agency Lake.	X		
4	Restore wetland supported by inflows from Wood River (no pre-defined path) and outflow to Agency Lake.	X		
5	Construct and operate small pilot study areas, primarily to refine design details and operating procedures necessary to proceed with intensive wetland restoration and water quality improvement projects on the Wood River property or on other lands.			X
6	Establish a wetland system/water quality treatment system that is designed to provide the specific flow distribution, retention time, and contact characteristics (vegetation/water contact) that enhance water treatment performance.			X

effects on air quality from both pollution sources would be limited to the duration of the activity or shortly thereafter.

## **Alternative A**

The least effects from dust and smoke would result, except during unauthorized, unplanned ignitions (wildfire), because neither prescribed burning nor major surface-disturbing activities would be initiated under this alternative.

## **Alternatives B, C, and D**

The effects of prescribed burning on air quality depend on the type and amount of material consumed, ignition technique, and fire residence time (duration the fire burns). Peat fires typical in muck soils have burning characteristics similar to charcoal fires, that is extremely hot fire producing little smoke for the volume of material burning. Surface fires in grass or wetlands produce more smoke due to the inefficiencies of the burning process. Peat fires tend to have long residence time and consume a great deal of fuel. Grass or tule fires burn quickly and have low volumes of fuel. The principal purpose for burning on the Wood River property would be to manage vegetation, which would be the quickly spreading fires of short duration in light fuels. Because burning would be conducted during unstable atmospheric conditions and with favorable transport winds, the effects from smoke would be limited to certain times of the year during favorable weather conditions.

## **Effects on Water Resources**

### **Assumptions**

Appendix 6 provides a general overview of the effect that wetlands have on water quality and quantity. Based on the principles outlined in that appendix, the analysis of effects on water resources is dependent upon the wetland functions that would be created or enhanced under each alternative. Certain wetland functions can be considered to have a "life expectancy", for example if the desired function is water quality improvement, the efficiency of water treatment could decline over time in some types of wetlands. To decrease the loss of efficiency, treatment or maintenance could be conducted. Costs and complexity of this maintenance would be the greatest under Alternative C, and water quality improvements would be maximized under this alternative. Water flow would be

controlled/manipulated the most under Alternative C, resulting in the least surface water retention time.

Water use for management of the Wood River property would occur according to Oregon State water laws and with the cooperation of the Meadows Drainage District. Until specific and detailed project plans are developed, the exact type and amount of water use cannot be specified, particularly as it relates to the beneficial use of water for the purpose of irrigating a wetland ecosystem. Because Oregon State water law embraces the prior appropriation doctrine ("first in time = first in right") and requires a specific beneficial use of water, changes or modifications to the water rights for the Wood River property could be necessary. These changes and modifications would be made in accordance with Oregon State water laws and, under these laws, cannot cause harm to water users holding senior (older) water rights.

## **Alternative A**

Chapter 2 outlines existing water quality problems affecting the planning area. Under Alternative A, it is expected that water quality in the Agency Lake ecosystem would continue to deteriorate. Nutrients would continue to be exported, due to the irrigation and grazing on the peat soils. Periodic dike maintenance would result in sediment entering Agency Lake, Sevenmile Creek, and Wood River. Completion of ongoing studies would provide additional understanding of water quality and quantity in the Wood River system and the Upper Klamath Basin and the processes that influence each. This understanding could lead to improvements in water quality/quantity elsewhere, as the information gathered could provide insights into management and restoration opportunities on other lands.

The sections of Sevenmile Creek and Wood River that are adjacent to the Wood River property would remain in an unnatural diked and channelized condition. Sediment transported from upstream areas would continue to accumulate in these channelized reaches due to the rivers' inability to transport and deposit these materials in appropriate flood plains, requiring periodic dredging to remove sediment. This would disturb and remove shoreline vegetation and bottom substrate, negatively affect channel and riparian function, and cause short-term water quality degradation.

An opportunity to increase late-season water storage in the Upper Klamath Basin through the creation of additional wetland habitat on the Wood River property

would not be realized. However, this alternative would not affect the potential for developing wetland restoration projects elsewhere in the Basin, which would provide similar benefits.

Continuation of existing grazing levels would result in a continuation of sedimentation and fecal pollution with commensurate water quality deterioration. According to Heady (1975), 7,200 AUMs of cattle use, which is the current level of use, would produce over 1,200 tons of manure and 440 tons of urine each year.

## Alternatives B, C, and D

The following effects on water resources from vegetation management, recreation activities, and water use would be similar under Alternatives B, C, and D. The level and intensity of effects would be directly proportional to the level and intensity of management action. Effects on water resources under Alternative A would be the least. Effects under the other alternatives are compared here.

**Vegetation Management.** Some types of vegetation management activities, such as livestock grazing, haying, prescribed fire, water level fluctuations, mechanical manipulations, and noxious weed control, could result in minor vegetative removal and nutrient removal. This effect could be offset by nutrients released back into or retained by the wetland system from organic matter debris from burning or livestock manure. Other types of vegetation management activities, such as planting native riparian and wetland vegetation, would increase vegetation amounts and would decrease dike erosion, resulting in positive effects on water quality. With little or no livestock grazing, water quality problems associated with cattle-generated waste would be reduced. According to Heady (1975), 7,200 AUMs of yearly cattle use would produce over 1,200 tons of manure and 440 tons of urine. This potential source of nutrient input would be reduced dramatically in proportion to the reduction in grazing use.

**Recreation Activities (including road and dike maintenance).** Recreation use (off-highway vehicles, motor boats, vehicular traffic) could cause localized water quality problems (sedimentation, release of nutrients) from direct inputs to water and wetland areas (erosion) and from resuspension of deposited sediment (vehicles stirring up dust, motor boats stirring up bottom sediments). These effects would be expected to be minor, transitory in nature, and dependent on the level, timing, and frequency of recreation use.

Recreation facility construction would need to be carefully designed to mitigate against adverse impacts to water quality, such as sedimentation (from earth moving), chemicals (from paving, painting, toilets), and any disturbances to soils and vegetation that would cause nutrients and toxicants to be suspended and then, possibly, transported into Agency Lake.

Road and dike maintenance would result in disturbance to soils and wetland areas, causing short-term (one to two years) impacts from increased sedimentation and nutrient releases. The net long-term effect would be an overall reduction in sedimentation, due to decreased erosion and damage to roads from recreation and other use.

Effects from recreation activities would be expected to be greatest under Alternative C and least under Alternative B.

**Water Use.** Under Alternatives B, C, and D there could be a net decrease in water use for the Wood River property compared to Alternative A, as water would be used to irrigate a wetland, and not a pasture. Evaporation from the wetland could approximate evaporation levels that would occur from Alternative A, as irrigation under the latter spreads water over the ground surface during the warm season. Wenner (1993) hypothesized that, due to the ability of wetlands to store water and provide for late season release of this water (see Appendix 6 for a discussion of this function), a significant increase in net water storage in the Agency Lake and Upper Klamath Lake systems is possible. For example, current irrigation use could consume up to five acre feet of water per acre per year. Converting the property to wetland would decrease this consumption. Accounting for evapotranspiration of approximately 2.4 acre feet per acre per year from the wetland, there could be a net water "savings" of about 2.6 acre feet per acre per year, or up to 19,800 acre net of net water storage (Wenner, pers. comm. 1993). Water rights would need to be exercised under Oregon State law and with the cooperation of the Meadows Drainage District.

## Alternative B

Appendix 6 provides a general overview of the effect that wetlands have on water quality and quantity. A modest improvement in water quality entering Agency Lake, compared to that under Alternative A, could result from implementation of this alternative.

**Stream Channel Restoration.** Effects from any of the stream restoration options, summarized in Table 6 and described in Chapter 3, would cause similar effects on water resources; however, Stream Channel Restoration Options 2 and 3 would require surface disturbance over a larger area causing a greater degree of impact than Option 1 would. Short-term sedimentation would occur from construction activities associated with the stream restoration projects. Nutrients and toxicants would be released into Agency Lake due to disturbance of the Wood River Marsh, riparian areas, and main property's interior when constructing the new channels. Water quality entering Agency Lake would be adversely affected from these materials in the short term. The potential for water stagnation problems associated with Stream Channel Restoration Options 1, 2, and 3 would be reduced compared to Wetland Restoration Options 3 and 4. Sediment, nutrient and toxicant levels would decline in a few years as new marsh and riparian vegetation is established and the new floodplain begins to function.

Any of the stream channel restoration options would provide benefits to groundwater recharge and flood flow retention. Reestablishment of a functioning wetland on the main property could eventually provide groundwater recharge. This could negatively affect other landowners in the spring, when they need to drain their property, but could also provide positive benefits in the summer through a decreased need to irrigate lands adjacent to the Wood River property. The groundwater recharge effect is expected to be minor because the Wood River property is located in a groundwater discharge area.

**Wetland Restoration.** All four wetland restoration options, summarized in Table 6 and described in Chapter 3, would affect water resources. As the main ranch property is converted to wetland, some nutrients would leach from the soil in the short term (one to two years) due to rewetting for extended periods of time. However, Wenner (1993) hypothesized that because oxidation of the peat soils would be greatly reduced, the resultant release of nutrients would also decrease in the short term. Therefore, after equilibrium is reached, the nutrient release could be more or less than that which now occurs during irrigation. As vegetation is established, there would be a net nutrient reduction (water entering versus water leaving the wetland) in the long term because of plant assimilation, sediment deposition and build up of peat. This net nutrient reduction would be expected to last 5 to 10 years, depending on the levels of sediment and nutrients entering the system (Wenner, pers. comm. 1993)

Additional effects from Wetland Restoration Option 1 could include improved circulation and increased dissolved oxygen levels from using the existing canal and pump system to manipulate water levels. Water stagnation problems would not be likely with this option. Under Wetland Restoration Option 2, the placement of culverts or other water control structures between Agency Lake, Wood River, Sevenmile Creek, and the main property could reduce improvements in water quality if the residence time of water in the wetland was reduced, if uncontrolled exit of nutrients or sediment from the wetland into the Agency Lake system occurred, or if stagnant water conditions persisted. In addition, some sedimentation and nutrient releases would result from disturbance of the peat-rich dikes during culvert installation. Under Wetland Restoration Options 3 and 4, sediment transport and water stagnation problems are unknown; therefore, water quality improvements are unknown.

Under any of the wetland restoration options, a moderate amount of shallow water wetland habitat would result (more than under Alternative A, less than under Alternative C, and equal to the amount of shallow water wetland habitat under Alternative D). Because shallow water favors vegetation growth, shallow water habitat could translate into improvements in water quality by vegetative uptake of nutrients and sediment deposition. Vegetation would also provide protection against sediment transport out of the wetland due to wind or water action. Conversely, this shallow water could result in higher temperatures and lower dissolved oxygen levels in waters that exit the wetland, which in turn could negatively affect water quality in Agency Lake. However, it is not expected that any potential reductions in dissolved oxygen would exceed or even meet the conditions that would occur from continued irrigation practices under Alternative A. Some increases in alkalinity could occur, due to leaching of plant material into the shallow water wetland. The effect of wetland restoration on pH is not known.

## **Alternative C**

Appendix 6 provides a general overview of the effect wetlands have on water quality and quantity. The greatest improvements in water quality would result from implementation of this alternative compared to the other alternatives.

**Stream Channel Restoration.** The effects on water resources from Stream Channel Restoration Option 1 would be the same as those described under Alternative B. Less surface disturbance from stream channel

restoration would occur under Alternative C than under Alternatives B and D.

**Wetland Restoration.** All four wetland restoration options in Alternative C, summarized in Table 6 and described in the Water Resources section of Chapter 3, would affect water resources. Effects from Wetland Restoration Options 1 and 2 would be the same as those under Alternative B. As the main property's interior is converted to wetland, in the short term (one to two years) some nutrients would leach from the soil due to rewetting for extended periods of time. However, it has been hypothesized that, because oxidation of the peat soils would be greatly reduced, the resultant release of nutrients would also decrease in the short term. Therefore, after equilibrium is reached, the nutrient release could be more or less than that which now occurs during irrigation. As vegetation is established, there would be a net nutrient reduction (water entering versus water leaving the wetland) in the long term because of plant assimilation, sediment deposition and build up of peat. Also, because water flow would be highly controlled in Wetland Restoration Options 5 and 6, residence times could be adjusted as needed to optimize water treatment. This net nutrient reduction would be expected to continue indefinitely, due to the periodic maintenance that would be performed for these options. However, short-term releases (up to six months) of sediment and nutrients would occur from this periodic maintenance, due to disturbance of berms, dikes and wetland vegetation from dredging or other pollutant removal activities.

Under Wetland Restoration Option 5, the effects of sediment, nutrients, temperature and water quality are unknown, due to the design of this alternative (various small scale pilot projects that vary spatially and temporally in number and extent), but would be proportional to the amount of ground affected by the pilot projects.

Under Options 1 and 2 in this alternative, a moderate amount of shallow water wetland habitat would result. Options 5 and 6 would result in the greatest amount of shallow water habitat than any other option. Effects related to shallow water habitat would be the same as those mentioned under Alternative B.

The continual maintenance required in Wetland Restoration Options 5 and 6 would result in the wetland system continuing to operate at maximum efficiency. Wetland plant species could be highly controlled to create maximum diversity and to optimize

their function as nutrient assimilators and sediment binders. However, the maintenance activities could involve some periodic ground and vegetation disturbance, which would lead to short-term releases of sediment and nutrients at higher concentrations than what is anticipated from wetland restoration under Alternatives A and B, and from Options 1 and 2 under Alternative C.

## Alternative D

Appendix 6 provides a general overview of the effect wetlands have on water quality and quantity. A modest improvement in water quality could result from implementation of this alternative.

**Stream Channel Restoration.** The stream channel restoration options summarized in Table 6 and described in Chapter 3 and Appendix 7 are the same as those described under Alternative B; therefore, the effects on water resources would be the same.

**Wetland Restoration.** Options 1 and 2, summarized in Table 6 and described in Chapter 3, would affect water resources. Effects on water resources from Wetland Restoration Options 1 and 2 would be the same as those under Alternative B.

Option 1 would create a moderate amount of shallow water wetland habitat; effects related to shallow water habitat would be the same as those mentioned under Alternative B.

## Effects on Wetlands

### Assumptions

Effects on wetlands include effects on the wetland function, vegetative community, water quality and quantity flowing through the wetland, and the habitat types provided for fish and wildlife. These effects overlap many of the other resources and therefore those sections also should be read and considered to get a complete picture of the environmental consequences for wetlands. Actual stream channel and wetland restoration activities would be similar to those scenarios (options) presented in Chapter 3 and summarized in Table 6. Effects from wetland restoration described in this chapter are based on those options and will be further analyzed, as necessary, when detailed projects are developed.

## **Alternative A**

The Wood River Marsh would continue to receive sediments and nutrients from upstream and would bind or assimilate a small portion of each. The proportion of wetland to upland vegetation on the property would remain about the same as what currently exists. Opportunities for wetland rehabilitation and/or restoration would not be pursued; therefore, an increase in the amount of wetlands in the Upper Klamath Basin would not occur. The composition of vegetation would remain the same or, if sediments are accumulated, could trend towards shallower water species. Additional effects on vegetation can be found in that section of this chapter.

Water on the property would continue to be pumped off in the spring so grazing could continue at existing levels, resulting in a continuation of siltation and fecal pollution with commensurate water quality deterioration. According to Heady (1975), 7,200 AUMs of cattle use, which is the current level of use, will produce over 1,200 tons of manure and 440 tons of urine.

## **Alternative B**

Until more information is gathered and detailed topographic survey work completed, the extent and depth of inundation by water and the habitat that would be produced is uncertain. It is estimated that a moderate amount of shallow water wetland habitat would be created with implementation of Wetland Restoration Options 1, 3, and 4, (summarized in Table 6) with some deeper water habitat anticipated near the Agency Lake dike. The least amount of shallow water habitat would be created under Option 2 because it allows the least amount of control over water levels. The diversity of wetland vegetation under any option would mimic what would naturally occur, due to colonization of the restored wetland by adjacent existing stands.

Periodic treatment of wetland vegetation by livestock or prescribed fire would generally serve to maintain vigor of existing species or could favor dominance of a certain species, but is not expected to radically change overall species composition. Some planting of riparian and wetland vegetation would occur, but would be limited in extent. These plantings would primarily be to provide habitat for various fish and wildlife species.

Development of parking areas or day use areas (see Map 3 in Chapter 3 for the approximate location), if it involves any fill work, would require coordination with the Oregon Department of Environmental Quality, the Army Corps of Engineers and other agencies to obtain

the necessary permits and to consult on mitigation of impacts to the existing wetland areas. All management activities would be designed to minimize their impacts to wetlands and water quality, using state-of-the art methods. Parking or day use areas could be constructed prior to wetlands restoration to negate the need for wetlands mitigation.

## **Alternative C**

Until more information is gathered and detailed topographic survey work completed, the extent and depth of inundation by water and the habitat that would be produced is uncertain. It is estimated that a moderate amount of shallow water wetland habitat would be created with implementation of Wetland Restoration Option 1, with some deeper water habitat anticipated near the Agency Lake dike. The least amount of shallow water habitat would be created under Option 2 because it allows the least amount of control over water levels. Options 5 and 6 would result in the greatest amount of shallow water wetland habitat.

Depending on the groundwater table elevation in the project area, various excavation techniques would be used to create specific wetland types. The depth of the excavation would depend on existing seasonal high, normal, and low water table levels. The diversity of wetland vegetation would be great, due to planting of various wetland vegetation types for study and to maximize water treatment. Because maintenance is expected, the wetland vegetation types established would be periodically disturbed or replaced. This would potentially result in regular changes in species composition and relative abundance.

The diversity of wetland vegetation under Options 1 and 2 would mimic what would naturally occur, due to colonization of the restored wetland by adjacent existing stands. Periodic treatment of wetland vegetation by livestock or prescribed fire would generally serve to maintain vigor of existing species or could favor dominance of a certain species, but is not expected to radically change overall species composition. Some planting of riparian and wetland vegetation would occur, but would be limited in extent. These plantings would primarily be to provide habitat for various fish and wildlife species.

The development of parking areas or day use areas on dike roads, if it involves any fill work, would require coordination with the Oregon Department of Environmental Quality, the Army Corps of Engineers and other agencies to obtain the necessary permits and to consult on mitigation of impacts to the existing wetland

areas. All management activities would be designed to minimize their impacts to wetlands and water quality, using state-of-the art methods. Each of the four parking lots proposed under this alternative is expected to be approximately 1/4-acre and could be constructed prior to wetlands restoration and negate the need for wetlands mitigation. (see Map 4 in Chapter 3 for location of parking areas)

## **Alternative D**

Until more information is gathered and detailed topographic survey work completed, the extent and depth of inundation by water and the habitat that would be produced is uncertain. Effects from Stream Channel Restoration Options 1, 2, and 3, and Wetland Restoration Options 1 and 2 would be the same as those under Alternative B.

Periodic treatment of wetland vegetation by livestock or prescribed fire would generally serve to maintain vigor of existing species or could favor dominance of a certain species, but is not expected to radically change overall species composition. Some planting of riparian and wetland vegetation would occur, but would be limited in extent. These plantings would primarily be to provide habitat for various fish and wildlife species.

The development of parking areas or day use areas, if it involves any fill work, would require coordination with the Oregon Department of Environmental Quality, the Army Corps of Engineers and other agencies to obtain the necessary permits and to consult on mitigation of impacts to the existing wetland areas. All management activities would be designed to minimize their impacts to wetlands and water quality, using state-of-the art methods. Parking or day use areas could be constructed prior to wetlands restoration to negate the need for any permits or wetlands mitigation.

## **Effects on Soil Resources**

### **Assumptions**

Based on the principles outlined in Appendix 6, the analysis of effects on soil resources is dependent upon the wetland functions that would be created or enhanced under each alternative.

## **Alternative A**

Soils on the main property would continue to subside (the extent of this subsidence is not known) and would continue to leach organics and nutrients (due to the

oxidation of the peats) into the Agency Lake and Wood River systems, which could cause reduced soil productivity in the long term. Soils would remain slightly compacted from continued livestock grazing; however, this effect is considered minor.

## **Alternatives B and D**

There would be some disturbance to soils from channel and wetland restoration activities, road and dike improvements, and construction and use of recreation facilities. Heavy machinery could cause some compaction and displacement of soil during construction. Levels of disturbance, compaction, and displacement would depend on the level of construction required by each management activity. Stream Channel Restoration Options 2 and 3, as summarized in Table 6 and described in Chapter 3, would cause the greatest level of soil disturbance and Wetland Restoration Option 1 would cause the least. Soils on the main property would become saturated with water and could accrete organic matter and nutrients. This would cause increased productivity and changes in soil microorganism composition/abundance.

## **Alternative C**

Effects on soils would be similar to those under Alternative B. Wetland and stream restoration options would be different under Alternative C than under Alternative B, and similar to Alternative B, levels of disturbance, compaction, and displacement would depend on the level of construction required. The least amount of soil disturbance would result from Wetland Restoration Option 1, described in Chapter 3. Under this alternative, periodic modification of pilot study areas and other wetland restoration methods would occur; therefore, effects on soils would occur over a longer period of time and over a larger area than under the other alternatives.

## **Effects on Vegetation**

### **Assumptions**

Effects on vegetation are analyzed in terms of the relative abundance of species within plant communities, the relative distribution of plant communities, and the relative occurrence of seral stages of those communities. Impacts on vegetation would result from wetland restoration and stream channel restoration options (summarized in Table 6 and described in Chapter 3), hydrologic regimes, livestock grazing, planting, fire management, nutrient regimes, and

recreation facilities and road maintenance. *Hydrologic regimes* (water depth, length of inundation, and season of inundation) would affect vegetation composition and structure.

*Planting* includes seeding or planting of native or exotic plant species to promote establishment of desired wetland and/or riparian vegetation to provide additional forage for wildlife or domestic livestock, to provide habitat features for wildlife, and/or to stabilize disturbed areas. Planting would affect the local composition of plant communities immediately after the plantings. Relative abundances of species would be affected by the species selected for planting and the reproductive potential of those species. Long-term changes in species composition and relative abundance of species in the various seral stages of vegetation succession could result from changes in nutrient cycling regimes from extensive use of nitrogen fixing species (for example, legumes) in the plantings.

*Fire management* would affect both species composition and relative abundance of species in plant communities. These effects would vary relative to fire behavior parameters such as intensity, rate of spread and fuels consumption which in turn are related to fire management prescriptions for fuel moisture, temperature, relative humidity and wind speed.

Nutrient inputs associated with livestock use and projects that include fertilization in their design could change *nutrient regimes* and thereby impact the species composition and relative abundance of species in aquatic vegetation. Runoff from these management activities could elevate nutrient levels in aquatic habitats which would favor expansion by native species adapted to those conditions, such as cattails, and/or the invasion of similarly adapted exotic pest species, such as purple loosestrife.

*Construction* of recreation facilities and road maintenance would not be expected to influence the overall character of the vegetation. However, disturbance associated with these construction and maintenance activities would provide conditions to which some species, including noxious weeds, would have a competitive advantage over other species. Also, if additional fill material is required, there would be the potential for the introduction of reproductive material of noxious weeds from outside the Wood River property.

Effects on special status species habitat are addressed in that section of this chapter.

## **Alternative A**

Riparian vegetation along the channelized Wood River would maintain its current distribution and abundance, with some additional protection provided by federal ownership (see the Riparian section of Chapter 3). Vegetation of the main property's interior would remain dominated by the pasture grasses, annual forbs and weedy species (including noxious weeds) characteristic of the property's current condition (Chapter 2 and Appendix 1).

The effects of nutrient regimes (see Assumptions at the beginning of the Effects on Vegetation section) would be most intense with the high carrying capacity and long season of use for livestock under Alternative A, which is the same as current conditions. The effects of recreation facilities and road maintenance would be the least because little or no recreation facilities would be provided and only minor maintenance would be done.

## **Alternative B**

**Stream Channel Restoration.** Historic meandering stream courses would be restored for the Wood River through the BLM-administered portion of the Wood River Marsh (Stream Channel Restoration Option 1) and within the interior of the main property (Option 3), and for Sevenmile Creek within the interior of the main property (Option 2). The meandering patterns and additional channels would increase the length and the resultant area of land occupied by riparian associated vegetation relative to Alternative A. Weed management activities and limitation of disturbances would be expected to facilitate establishment of a native riparian plant community.

**Wetland Restoration.** Short-term effects on vegetation would be the least from Wetland Restoration Option 1. Wetland Restoration Options 2, 3, and 4 could require highly engineered techniques initially, but would be designed to require minimum maintenance in the long term. Native wetland species, such as tufted hairgrass, sedges, rushes, bulrush, and cattail (Appendix 1), would become more abundant, dense, and widespread on the property. At the same time, both native and introduced upland and weedy species, such as cheatgrass, quackgrass, thistles, mullein, and salsify, would become less abundant, dense and widespread on the property. Mechanical disturbance from Options 2, 3, and 4 would create conditions in the short term to which many noxious weeds would have a competitive advantage over other species. However, the minimum maintenance required in the long term would minimize disturbance and allow the develop-

ment of native dominated plant communities similar to those characteristic of particular sites before conversion of wetlands to pasture, given the frequency and intensity of natural disturbance events. The dominance of these communities would reduce the structural and seral diversity within the property, but would provide the structural components and relative species composition lacking in the landscape.

**Hydrologic Regimes.** Hydrologic patterns would resemble those that occurred on the property before conversion of the wetlands to pasture. Therefore, native species adapted to the amounts of water occurring during seasons and for periods of time determined by precipitation patterns and seasonal variations in water flow would have a competitive advantage over other species. Native dominated plant communities would result with species compositions and relative species abundances similar to plant communities that existed before conversion of wetlands to pasture, given the frequency and intensity of natural disturbance events.

**Livestock Grazing.** Livestock grazing would be used only to achieve specific management goals, thus minimizing disturbance from livestock use to promote the development of the native-dominated plant communities, which would be similar to those characteristic of particular sites before conversion of wetlands to pasture, given the frequency and intensity of natural disturbance events.

**Planting.** The scale of the effects of planting (see Assumptions) would vary across the alternatives relative to the number of acres that would be subjected to these treatments, but would generally be the least under Alternative B (planting would not occur under Alternative A).

**Fire.** Fire would be reintroduced as an ecosystem process that would promote the development of native plant communities characteristic of particular sites before conversion of wetlands to pasture. Generally, prescribed fire prescriptions would allow for burning during the fall which would more closely imitate the natural fire cycle to which native species are adapted. Species composition and relative abundance of species in plant communities would be affected by favoring species that have phenological cycles (see Glossary) that enable them to persist or reproduce successfully after a late summer or fall fire.

**Nutrient Regimes.** The effect on nutrient regimes (see Assumptions) would generally be a reduction in nutrient inputs to aquatic habitats due to the limited use of livestock grazing proposed. Extensive fertiliza-

tion would not occur, minimizing the effects of nutrient runoff from this source.

**Recreation Facilities and Road Maintenance.** The scale of the effects from recreation facilities and road maintenance (see Assumptions) would vary across the alternatives relative to the number of developments and extent of maintenance planned for the area. These effects would be greater than under Alternative A, but less than under Alternative C.

## Alternative C

**Stream Channel Restoration.** Historic meandering stream courses would be restored for the Wood River only through the BLM-administered portion of the Wood River Marsh. The meandering pattern would increase the length and the resultant area of land occupied by riparian associated vegetation relative to Alternative A, but the area occupied by riparian vegetation would be less than in Alternative B, because of its Stream Channel Restoration Options 2 and 3. The disturbance associated with restoration activities would provide conditions to which many noxious weeds would have a competitive advantage over other species, but this would occur over less area than in Alternative B. Again, weed management activities and limitation of disturbances would be expected to facilitate establishment of a native riparian plant community.

**Wetland Restoration.** Wetland Restoration Options 1, 2, 5, and 6 (summarized in Table 6) would promote native wetland species, such as tufted hairgrass, sedges, rushes, bulrush, and cattail, to become more abundant, dense, and widespread on the property. At the same time, both native and introduced upland and weedy species, such as cheatgrass, quackgrass, thistles, mullein, and salsify, would become less abundant, dense, and widespread on the property. However, the disturbance associated with Options 5 and 6 could create conditions to which many noxious weeds would have a competitive advantage over other species. Options 5 and 6 would also result in diversity of seral stages of wetland vegetation, and the relative species abundances characteristic of those seral stages including some areas with native dominated plant communities similar to those characteristic of particular sites before conversion of wetlands to pasture.

**Hydrologic Regimes.** Wetland Restoration Options 2, 5, and 6 could result in hydrologic patterns that would differ from those determined by precipitation patterns and seasonal variations in water flow. Plant species adapted to these patterns would have a

competitive advantage over other species, and species composition and relative abundance would differ from that under Options 3 and 4 under Alternative B. These species could include exotic (introduced) species, including noxious weed species.

**Livestock Grazing.** Effects from livestock grazing would be similar to those described under Alternative B.

**Planting.** The scale of the effects of planting (see Assumptions) would vary across the alternatives relative to the number of acres that would be subjected to these treatments, but would generally be the most under Alternative C.

**Fire.** Prescribed fire would be applied according to the goals and design of various experimental management regimes. Species composition and relative abundance within plant communities would be affected by favoring species that have phenological (see Glossary) cycles that enable them to persist or reproduce successfully after a fire occurring under the prescribed conditions and season.

**Nutrient Regimes.** The effect on nutrient regimes (see Assumptions) would generally be a reduction in nutrient inputs to aquatic habitats due to the limited use of livestock grazing proposed. Experimental fertilization could be used, possibly affecting aquatic habitats, depending on the level and extent of the fertilizer application.

**Recreation Facilities and Road Maintenance.** The scale of the effects from recreation facilities and road maintenance (see Assumptions) would vary across the alternatives relative to the number of developments and extent of maintenance planned for the area. These effects would be greatest under Alternative C, since the greatest level of activity would occur under this alternative.

## **Alternative D**

**Stream Channel Restoration.** Stream channel restoration options would be the same as those under Alternative B; therefore, effects on vegetation would be similar to those under Alternative B.

**Wetland Restoration.** Effects from Wetland Restoration Options 1 and 2 would be the same as those under Alternative B.

**Hydrologic Regimes.** A majority of the area would support hydrologic patterns that would resemble those

that occurred on the property before conversion of the wetlands to pasture, as determined by precipitation patterns and seasonal variations in water flow. These areas would support species compositions and relative species abundances similar to Alternative B. In other areas, hydrologic patterns would differ from those determined by precipitation patterns and seasonal variations in water flow, and would result in a vegetation with species composition and relative abundance that would differ from that on the rest of the property.

**Livestock Grazing.** Effects from livestock grazing would be similar to those described under Alternative B.

**Planting.** The scale of the effects of planting (see Assumptions) would vary across the alternatives relative to the number of acres that would be subjected to these treatments, but would generally be greater than under Alternative B and less than effects under Alternative C (planting would not occur under Alternative A).

**Fire.** Fire would be reintroduced as an ecosystem process that would promote the development of native plant communities characteristic of particular sites before conversion of wetlands to pasture over most of the area. Some prescribed fire would be applied according to the goals and design of the an experimental management regime. Therefore, over much of the property, fire effects on vegetation would be similar to those under Alternative B. However, in some areas where experimental methods were applied, species composition and relative abundance within plant communities would be affected by favoring species that have phenological (see Glossary) cycles that enable them to persist or reproduce successfully after a fire occurring under the prescribed conditions and season.

**Nutrient Regimes.** The effect on nutrient regimes (see Assumptions) would be the same as that under Alternative B.

**Recreation Facilities and Road Maintenance.** The scale of the effects from recreation facilities and road maintenance (see Assumptions) would vary across the alternatives relative to the number of developments and extent of maintenance planned for the area. The scale of these effects would be determined by a recreation plan that would be written after determining recreation needs through monitoring. Based on the likely recreation development scenario described in Chapter 3, it is anticipated that the effects would be similar to those under Alternative B.

## Effects on Fish and Wildlife Habitat

### Assumptions

Fish habitat would be increased the most if historic meander patterns were recreated for Wood River and Sevenmile Creek; however, that method of stream restoration would have the greatest short-term negative effects on fish from the increased disturbance and sediment load.

Maintenance of dikes and dike roads under best management practices (such as using large rip-rap and establishing a woody riparian zone at the base of the rip-rap) would reduce sedimentation from the dikes, which would benefit fish. The stabilization of the dikes would allow better vegetation structure along the dikes, and would benefit suckers and other fish. This vegetation structure would also benefit bird and mammal species that prefer these riparian zones. The large rip-rap would provide cavities and denning sites for many mammals, such as otter, mink, and weasels. However, the improvement of dikes could reduce the amount of shallow exposed mudflats that are now available at the base of some dikes, which are used by shorebirds. These impacts and benefits would be consistent throughout the alternatives.

Noxious weed control is mandatory. Negative impacts to wildlife habitat would be destruction of certain habitats during control procedures. Mechanical or chemical procedures could destroy some non-target species. This effect is expected to be minimal because treatment areas usually would be small and widely scattered. On the other hand, these small treatment areas would create habitat diversity in the large units. Small areas of treatment would create pockets of early seral conditions in wetland habitat.

### Alternatives A, B, C, and D

The ratio of wetland/marsh to pasture/meadow habitat would remain the same under Alternative A and would increase under Alternatives B, C, and D. The greatest amount of shallow water habitat could be created under Alternative C, due to the abundance of berms and containment structures being constructed. The greatest amount of deep water habitat would be created under Alternative B, based on the potential wetland restoration methods proposed.

### Alternative A

Continued periodic dredging of the Wood River would adversely affect fish habitat as bottom conditions (substrate) would continue to be made up of fine sediments, which are not conducive to spawning for most fish species. Quality and quantity of vegetation along edges of the stream, which is needed for escape cover, would also be continually disrupted. This lack of edge vegetation in shallow water habitat could have a negative effect on larval suckers during their emigration from spawning areas.

Wetland restoration would not take place, and the proportion of wetland to meadow habitat would remain constant; water would continue to be pumped off the property in the spring, and livestock grazing would continue at current levels. Therefore, the majority of the property would continue to be comprised of pasture and meadow communities. Species that prefer these habitats, such as ground squirrels and ground dwelling birds, would continue to prosper with this alternative. Implementing various grazing systems, such as pasture rotations, would provide some areas with taller vegetation. This would be favorable to birds, such as puddle ducks, shore birds, and blackbirds which prefer to nest in meadow areas with taller vegetation. The taller vegetation would also improve the existing meadow habitat for small mammals (such as mice and ground squirrels). This in turn would benefit raptors and mammals that feed on small mammals.

Protecting the riparian zones from grazing would improve the vegetation communities in these areas. This would benefit species that use this habitat. The improvement in riparian zone conditions would be the same in all alternatives, however the quantity of riparian vegetation would be similar under Alternative D and higher under Alternatives B and C due to the potential development of berms and dikes. The quantity of riparian vegetation would be highest under Alternative C.

Due to the potential increase in public use and the area closure to motorized vehicles, there could be an increase in foot traffic along the main dike road. This would increase disturbance to nesting neotropical birds in this area. The stand of cottonwood trees along this road probably contains the highest density of neotropical birds on the property. In the past most traffic has been in vehicles which pass quickly and time of disturbance is short, and often birds get accustomed to this type of disturbance. Pedestrians move slowly and wildlife often is more disturbed by a person on foot.

than in a vehicle. The pedestrian traffic would be greatest under Alternative A. Even though there may be more visitors under the other alternatives, the disturbance would be less since most traffic would be in cars and would pass quickly.

## **Alternative B**

Stream channel restoration or reconstruction that establishes meanders would improve the amount and type of fish habitat. Reestablishing meanders in the stream would allow natural processes to create pools and riffles, improve temperature regulation in the stream, and allow creation of edge habitats that would be used by trout and suckers as escape cover. After the edges of these new channels have stabilized with vegetation growth there would be an increase in habitat for larval and juvenile suckers and other fish.

The effects of wetland restoration on wildlife would be based on final vegetation patterns which would be affected by how restoration is accomplished overall. Use of the marsh by diving ducks, otters, muskrats, and other wildlife would be higher under this alternative than under the other alternatives due to the depth of water. There would be a shift in use patterns for species such as white-fronted geese, migrating waterfowl, and various raptors. Under this alternative, geese and migrating waterfowl would use the property as a resting area in spring and fall, whereas under Alternative A, the area would be used as a feeding area, and the waterfowl would use the main lake or open water for resting. Species that prefer upland or short grass (meadow) habitat could be significantly adversely affected by the change in habitat on the Wood River property. Raptor use would change because of the prey species available. Use by rough-legged and redtail hawks in the winter could decrease due to the reduction in small mammals present. Use by ground dwelling birds, such as blackbirds and sparrows, would be less under Alternative B than other alternatives due to the change from a meadow to wetland community.

Changing stream flow patterns could also affect wildlife use. Changing inflows without a predefined path could have negative effects on migrating fish. Juvenile fish moving downstream may not be able to survive because they get trapped in wetland areas and succumb to poor water quality (high temperatures, low dissolved oxygen) before finding a path to the lake. Adult fish may also find a spawning migration barrier if the entire stream flow is diverted.

Manipulating water levels on the property with the existing canal and pump system would allow control in

development of desired vegetation communities and maintenance of desired water levels. This may prove beneficial in maintaining critical habitat for special status species. Installation of culverts in existing dikes could affect water quality (temperature regulation, and dissolved oxygen) on the newly flooded wetland. This could improve conditions for fish and result in increased use by trout, Lost River and shorthose suckers, especially in areas with flowing water. The zone between the lake and the wetland area is important to suckers and installation of culverts would increase this kind of habitat. The culverts would allow increased movement by animal species and facilitate colonization of the new wetland. Aquatic species such as muskrat and fish, would benefit from these passage ways. More mobile species, such as birds or otters, and their ability to colonize new areas would not be affected by the culverts. The newly created wetland would benefit the spotted frog (federal candidate species). However, if bullfrogs are present in the Wood River the addition of culverts could allow them to enter the area and prey on the resident population of spotted frogs.

Placing logs or trees in streams would improve fish habitat under this alternative.

More clumps of trees (willows and aspen) would be planted under this alternative so potential neotropical migratory bird and raptor habitat would be more abundant under Alternative A, but less than under Alternatives C or D. Creating shrub communities on the dikes would have more benefits to neotropical migrants under Alternative B than under Alternative A. Alternative B would be less favorable than Alternative C because of the fewer dikes for potential shrub habitat.

Due to the increased amount of access under this alternative, there could be more potential disturbance to wildlife from recreational users. Recreation development would have minimal effects on habitat, but would attract more people to the area and create more potential disturbance. If the majority of the recreational use occurs during mid to late summer, which is outside most critical bird nesting periods, impacts would be minimal. Development of recreational facilities and improvement of roads would tend to concentrate disturbances to wildlife.

Removal of fences and buildings from the property would eliminate most of the existing perch sites from the area. These sites are important for hunting perches (for example raptors or bluebirds), territorial displays (meadowlarks), or loafing areas (neotropical birds).

Livestock grazing could be used as a tool for vegetative management. Effects on wildlife habitat would depend on the management objectives and the level (intensity) of grazing. In general, livestock grazing could create habitat diversity. However, under this alternative any such treatment could have a negative impact since there is no way to limit usage to particular areas. Mowing and haying could also create the same type of diversity and be limited to preferred areas.

Use of fire as a management tool would generally have a short-term negative impact, because of destruction and elimination of habitats. However, impacts over the long term generally would be beneficial because of the creation of vegetative diversity within a large ecosystem. Fire is a natural process that historically provided diversity and re-distributed nutrients throughout the basin by burning and dissipating them through smoke and ash.

### **Alternative C**

Because of the various wetland restoration options proposed, Alternative C would create a greater variety of habitats than under the other alternatives. Since high maintenance wetland systems would be allowed, the variety of habitats could be maintained. This alternative could also allow for specific species management in various portions of the property (for example, manage for spotted frogs in one area, yellow rails in another area). Management of critical habitats for these species could be developed and monitored closely.

Effects on wildlife from water treatments would vary based on design of water treatment and desired outcome. If deep water and dense vegetation were desired to reduce amount of nutrients in the water, then wildlife, such as muskrats, tri-colored blackbirds, and bitterns would be positively affected; shorebirds and those using more open water, such as terns and osprey, would be negatively affected. Projects would still be more beneficial to these species than under Alternative A, however.

In general, the addition of water control structures would benefit wildlife because they would allow the management of a variety of habitats or the ability to manage a specific water level to benefit certain species. This flexibility would be greater under this alternative than under Alternatives A or B.

Intensive development of wetlands would result in more rapid development of wetland habitats. This would be more beneficial than under Alternative B, since the development under Alternative B would take

longer. Also, planting and seeding of various wetland plants would be more beneficial under this alternative than B. Lack of seed source could preclude these plants from becoming established in Alternative B. Establishment of these plant communities would not be possible in the majority of the Wood River property in Alternative A.

Due to the variety of habitats that would be available under this alternative, the impacts to wildlife would be moderated. There would be an increase in use by wildlife preferring deeper water. This increase would be more than Alternative A, but may not be as much as Alternative B. The reduction in grassland/meadow habitat would be less than Alternative B, but since grassland communities would be better developed (less grazing) than Alternative A, the reduction of wildlife in these habitats would be minimal.

Restoration of stream channels would have the same benefits as discussed under Alternative B. Since the amount of channel restoration is less under Alternative C, the benefits would be less than Alternative B, but more than Alternative A.

Placement of structures in the streams would benefit fish by creating more hiding cover. Under this alternative a variety of structures could be used ranging from trees or root wads to artificially or man made structures such as car bodies or cement blocks. Each type of structure would have benefits of providing escape cover; some could provide better cover or possibly a forage substrate. The option to use a variety of structures would also have a benefit of reduced costs. This would allow more opportunities for structures to be placed in streams, which would provide escape cover in more areas than in Alternatives A or B.

Wildlife habitat developments proposed under this alternative; raptor perches, nest structures for waterfowl, and blue birds, would benefit these species. These benefits would be more under this alternative than under Alternatives A or B. As new management techniques are developed, they could be applied under this alternative. Some of the techniques, such as artificial nest structures or exotic vegetation management, could be precluded under Alternatives A or B.

Creating shrub communities on the dikes would have benefits to neotropical migratory birds. Since there would be more dikes created under this alternative, the potential benefits would be greater than Alternatives A and B, but less than Alternative D. More clumps of trees would also be planted under this alternative.

Due to the increased amount of recreational development there would be the greatest potential for disturbance from recreational users under this alternative than under the other alternatives. Recreation developments would have minimal effects on habitat, but would attract more people to the area and create more potential disturbance to animals. If the majority of the recreational use occurs during mid to late summer, which is outside most critical bird nesting periods, impacts would be minimal. Development of recreational facilities and improvement of roads would tend to concentrate or localize disturbances to wildlife.

Livestock grazing could be used as a tool for vegetative management under this alternative. Effects on wildlife habitat would depend on the level (intensity) of grazing. In general, livestock grazing could create habitat diversity. Mowing and haying would also create diversity. Since this alternative has more cells or units, all these tools could be used more intensely and effectively.

Use of fire could also be more controlled and used more intensely under this alternative than under Alternative B.

## **Alternative D**

Restoration of meanders in stream channels would allow the stream to create its own pools and riffles, regulate temperature and create edge habitats. All these factors would benefit fish habitat. These beneficial effects would be comparable to Alternative B, but more than Alternatives A or C due to the amount of channel work that would be done.

Re-establishing lake/wetland interface would also have the same impacts as discussed under Alternatives B and C.

Placement of natural materials in the stream for fish habitat would be similar to Alternative B. Due to the restriction of using "natural" materials under this alternative, the number of structures placed would probably be less than Alternative C due to the cost and availability of materials.

Planting trees and shrubs on the dikes would have similar benefits to neotropical birds under this alternative compared to Alternative B, and less favorable than Alternative C because of the fewer dikes for potential shrub habitat.

Recreational development would be more carefully designed to the users needs after monitoring determines the need for development. By carefully monitor-

ing type of uses, development could then be more carefully planned to avoid wildlife conflicts. Recreational impacts to wildlife would be less under this alternative than Alternative C.

The benefits of vegetative management activities (such as grazing, mechanical, and fire) would fall between Alternatives B and C.

## **Effects on Special Status Species Habitat**

### **Assumptions**

Management activities that affect general fish and wildlife habitat generally also affect special status fish and wildlife species habitat, and activities that affect vegetation could affect special status plant species habitat (if any is found to exist on the property); therefore, those sections contain a more complete picture of the potential environmental consequences and should be read in conjunction with this section.

## **Alternatives A, B, C, and D**

**Plants and Animals.** Adverse effects on federally listed or proposed species are not anticipated since they would be managed as required by the Endangered Species Act, as amended. Implementation of management actions designed to protect and increase populations of federally listed species, if found, would be expected to result in larger numbers and increased vigor of individuals, and larger sizes and number of populations.

Under all four alternatives, no effects on federal candidate, state listed, state candidate, or Bureau sensitive species would be expected because Bureau policy would be to conserve these species through protection of habitats and populations of these categories of species. Effects on Bureau assessment species would be possible if funding or positions do not allow for surveys to detect these species in areas subject to surface disturbing management actions. Effects on Bureau assessment species from management actions could occur at the discretion of management.

**Plants.** There is no protection provided to special status plants on private lands. However, on neighboring National Forest lands, many of the same species are managed. Modeling to determine minimum viable populations and extinction probability has not been used for special status plant species documented on

BLM-administered lands. Therefore, it is not known what percentage of populations could be eliminated and the population still remain viable. If impacts reduced populations below minimum viable levels and the species did not have a sufficient soil seed bank to support rapid recovery, the population would become vulnerable to extinction. If recovery did not occur, these long-term impacts would result in an irreversible and irretrievable commitment of the resource leading to extinction of the species.

**Fish and Wildlife.** The effects on special status species would depend on the species and the degree of alteration to their habitats. Impacts to all wildlife species, including some special status species are discussed in the Wildlife Habitat section and are not repeated here. In general, activities that benefit fish habitat would benefit the listed suckers. Bald eagles would benefit by potential nest site development, perch sites, or improvement of prey base. Summering populations of bald eagles would benefit from improved fish populations. Wintering populations of eagles generally hunt wintering waterfowl (mostly puddle ducks and geese), therefore improvement of habitat for puddle ducks and geese would directly benefit wintering bald eagles. Management of habitats for one special status species could have negative effects on other special status species. In order to manage all special status species, the BLM will strive to maintain or create a variety of habitats.

## Effects on Recreation

### Assumptions

The Wood River property has been in private ownership, and therefore closed to the general public, until July 1993. It is assumed that use levels will increase over those of the past, but how much of an increase is unknown. Planned and expected use levels would increase the most under Alternative C because of the number of roads that would be improved and open to motorized vehicles, and the level of facilities that would be provided. Planned and expected use levels would increase the least under Alternative A because the area would remain closed to motorized vehicles and few, if any, facilities would be provided.

### Alternative A

Adoption of this alternative would probably lead to the least number of visitors or recreationists using the area, as compared to the other alternatives. However, because the area was under private ownership and

was only available for use by a few members of the public (through hunting clubs) until recently, and because the area would be open to public use but closed to motorized vehicles, the numbers of recreationist visiting the area would be expected to increase slightly under this alternative. No current recreation visitor use numbers are available for this area, and no estimate of the level of increase has been determined.

Restricting the area to non-motorized recreation opportunities would benefit those recreationists seeking more primitive (less structured) recreation or greater solitude and would help meet the projected regional demand for non-motorized recreation, while those recreationists seeking recreation developments or motorized recreation opportunities would be negatively affected under this alternative.

Currently, easements are held by Tulana Farm employees and hunt club members, which allows them motorized vehicle access across the Wood River property along the south dike road. This access effectively gives them motorized access that is not afforded other members of the public, which is causing conflicts between the two groups of users. Although the property is closed to motorized vehicles, enforcement of this closure has been difficult because of a lack of BLM and non-BLM law enforcement presence, and because with so many people possessing legal access, it is difficult to keep the gate locked at all times.

### Alternatives B and D

Stream channel and wetland restoration activities, planting and seeding of native riparian and wetland vegetation, decreased levels of livestock grazing, and removal of certain facilities (such as the buildings, fences, and corrals) would improve scenic quality and sightseeing/wildlife viewing opportunities in the long term; although in the short term (during and shortly after earthwork associated with restoration activities), both scenic quality and sightseeing/wildlife viewing opportunities would be decreased. Increased hunting, fishing, hiking, mountain biking, horseback riding, sightseeing, and educational pursuits and opportunities also would be expected as a result of a greater amount of wetland habitat on the property.

Compared to Alternative A, greater recreation opportunities would be available, through the availability of motorized vehicle access, development of recreation facilities, and increased BLM management emphasis (such as identifying the area as a Watchable Wildlife site and designating the property as an area of critical

environmental concern). This would help meet the regional recreation demand for non-motorized and motorized travel, and other recreation activities, including wildlife viewing, nature study, and visiting interpretive displays. The number of recreationists visiting the area would be expected to increase over levels under Alternative A.

Recreationists seeking a more structured recreation experience, through the availability of recreation facilities, interpretative opportunities, trails, etc., would benefit by implementation of either Alternative B or D. Recreationists seeking greater solitude or a non-motorized recreation experience would be slightly negatively affected (they would be more negatively affected under Alternative D); however, areas beyond gated roads and away from developed facilities, would still be available for non-motorized recreation opportunities. Those recreationists seeking jet boat or air boat use areas would be negatively affected by implementation of either Alternative B or D; however, less noise and wildlife disturbance would result in positive effects on most other recreationists.

The availability of suitable land for developing parking areas on the south dike road and east (Wood River) dike road could severely restrict the ability to provide sufficient parking and day use areas, including a visitor center. A suitable site, located on the east dike road, could be developed with minimal fill. The development of parking areas or day use areas on the south dike road would require filling in portions of potential wetland areas. See Map 3 for the recreation development scenario under Alternative B, and Map 5 for the likely recreation development scenario under Alternative D.

Development of improved roads and parking areas could negatively affect the quality of hunting, fishing, and wildlife viewing experiences due to greater disturbances from increased motorized access and recreation use. If necessary, motorized vehicle use could be restricted due to inadequate space for parking because parking and motorized use would be limited to the improved roads and parking areas (south and east dike roads). This would have a negative effect on motorized recreationists.

## **Alternative C**

Stream channel and wetland restoration activities, planting and seeding of native riparian and wetland vegetation, decreased levels of livestock grazing, and removal of certain facilities (such as the buildings, fences, and corrals) would improve scenic quality and sightseeing/wildlife viewing opportunities in the long

term; although in the short term (during and shortly after earthwork associated with restoration activities), both scenic quality and sightseeing/wildlife viewing opportunities would be decreased. Due to the nature of wetland restoration options expected under Alternative C (see Chapter 3 for a description of the options), the increase in scenic quality would be less than that under Alternatives B or D. The largest increases in hiking, sightseeing, horseback riding, mountain biking, and educational pursuits and opportunities would be expected under this alternative. Hunting and fishing access and opportunities could be more intensely managed causing restrictions, depending on locations and types of wetland restoration projects. This could negatively affect hunters and anglers.

Implementation of Alternative C would provide the greatest number of recreation opportunities, through more elaborate and/or more developed recreation facilities, the greatest level of motorized vehicle access, and the greatest level of BLM management emphasis (such as providing wetland restoration education interpretation, identifying the area as a Watchable Wildlife site, and designating the area as an area of critical environmental concern). The number of recreationists visiting the area would be expected to increase the most. This would help meet the demand for motorized travel and other recreation activities, such as wildlife viewing, nature study, and visiting interpretive displays. The projected demand for non-motorized recreation opportunities would benefit the least under this alternative.

Recreationists seeking more structured recreation experiences through highly developed facilities would benefit the most by implementation of Alternative C because of the availability of interpretation, education, and social interaction. Recreationists seeking greater solitude or non-motorized recreation experiences would be the most negatively affected because little opportunity would be available for the non-motorized recreationists due to the level of road access on the property. Those recreationists seeking jet boat or air boat use areas would be negatively affected by implementation of this alternative. Less noise and wildlife disturbance would result in positive affect on most other recreationists. Quality of hunting, fishing, and wildlife viewing experiences would be less than that under Alternative B or D due to the potential for greater disturbances to wildlife from increased motorized access and recreation use in the long term, and short-term disturbance from stream and wetland restoration projects.

Four parking areas are proposed under Alternative C. Depending on the results of the topographic survey,

the preliminary locations (see Map 4) may need to be changed or even eliminated if it is found that they could be inundated by water when the property's interior is flooded. In addition, since wetland restoration has priority over recreation facilities, the locations, sizes, and numbers of parking lots and other facilities could be modified depending on the location and type of restoration method.

## Effects on Visual Resources

### Assumptions

Surface-disturbing activities would disrupt the existing land surface and thereby cause effects on visual resources. In the long term, the Wood River property would be managed to meet Visual Resource Management (VRM) Class II or III objectives (except under Alternative A); however, currently the property and surrounding private pastureland are in a highly modified condition and are currently estimated to be in a VRM Class IV condition (major modification of the natural character of the landscape, management activities dominate the view and are the major focus of viewer attention). Many, if not most, of the proposed activities under Alternatives B, C, and D present opportunities to improve or provide positive effects to visual resources. These activities would help meet the long-term visual resources objective by moving toward a more natural condition for the visual landscape.

In the short term, it is expected that successful revegetation of proposed surface disturbing activities would occur rapidly with replanting and reseeding. Although greater contrast between the disturbed surface or project and the existing landscape would be expected immediately after surface disturbance, visual resources are to be managed for the long-term objectives as stated above.

### Alternative A

Adoption of this alternative would result in a continuation of the existing highly modified visual resource condition. Few opportunities would be available to improve the visual resources or create a more natural character for the visual landscape. One such opportunity includes prohibited grazing in riparian areas, which would result in a slightly positive effect on visual resources; however, long-term management of the visual resources would likely remain at the VRM Class IV level.

### Alternatives B and D

In the long term, the opportunity to meet VRM Class II objectives would be greatest under these alternatives. The stream and wetland restoration activities (see the Water Resources sections in Chapter 3), vegetation management methods (such as planting native vegetation along river and creek banks, in pastures, and along roads and dikes), and removal of some fences and other structures would provide the most positive effects to visual resources.

Some short-term (1 to 3 year) negative effects on visual resources would occur from surface-disturbing activities. However, positive effects would be expected in the long term as more natural vegetation succeeds. Recreation facilities would be designed to be rustic, natural appearing, and blend in with the natural landscape, and therefore would have only a minimal effect on visual resources.

### Alternative C

Under this alternative, opportunities to meet VRM Class III objectives could occur in the long term. Proposed wetland restoration activities would cause positive effects on visual resources when compared to the No Action Alternative. Examples of these activities could include constructed wetlands with artificial water circulation and small pilot study areas. Vegetation management (such as revegetation of stream banks, dikes, roads, and pasturelands) and removal of some fences and other structures would also positively affect visual resources. Some short-term (1 to 3 year) negative effects on visual resources could occur from surface-disturbing activities. Through careful placement of artificial or experimental wetland areas and vegetative screening, long-term positive effects on visual resources would be expected. Although larger and more elaborate recreation facilities could occur under this alternative, these facilities would be designed to be rustic and natural appearing, and blend in with the natural landscape; therefore would have only a minimal effect on visual resources.

## Effects on Cultural Resources

### Assumptions

Cultural resources would be protected during construction and other surface-disturbing activities.

## Alternative A

The least amount of damage to cultural resources would occur under this alternative. Continued flooding and draining would cause disintegration of perishable resources, if any were present. Livestock grazing also could adversely affect cultural resources. If known sites were being adversely affected, then protection strategies, such as fencing a site from livestock trampling, would be implemented.

## Alternatives B, C, and D

Stream channel restoration methods could require extensive earth moving to recreate the historic meandering channels of both Wood River and Sevenmile Creek, potentially causing damage to or destroying cultural sites and resources. Surface testing, stream bank indicators, and continuous monitoring by an archaeologist would mitigate this potential damage. Positive impacts on cultural resources from this restoration work would include discovery of new sites and artifacts that could enhance the knowledge base of cultural resources in the area.

Various vegetation management methods could adversely affect cultural resources. Fluctuations in water levels causing alternative wet/dry periods, which could occur under some of the wetland restoration options, would cause disintegration of perishable resources, such as artifacts made from reeds. Salvage operations could mitigate this impact. Prescribed burning could destroy plant fiber and/or wood artifacts. This would be an irretrievable commitment of resources. Burning also leaves carbon behind, making it impossible to conduct carbon-14 dating tests to determine the age of a cultural resource or site.

Increases in recreation use could also adversely affect cultural resources. As more people use the area, the opportunity for intentional and unintentional stealing and destroying of artifacts and sites. Waves from power boats would undercut (erode) stream banks, possibly destroying or unearthing sites. Speed restrictions and stream bank stabilization, including planting native trees and rip-rapping, would mitigate this impact.

## Effects on Livestock Grazing

### Assumptions

For comparative impact analysis purposes, the maximum potential grazing capacity of the entire

Wood River property (7,200 AUMs) was added to the total grazing capacity of the Klamath Falls Resource Area prior to acquiring the Wood River property (13,869 AUMs). This gives a total grazing capacity of 21,069 AUMs for the Resource Area, which is the number that will be used to compare impacts against.

Maximum grazing use on the Wood River property would not increase over recent levels under any of the alternatives, and would significantly decrease under Alternatives B, C, and D. Under all of the alternatives, the BLM would more strictly control, direct, and stipulate the grazing use, compared to what has occurred in the past. This is due to the mandates and requirements of various federal laws, policies, and regulations that the BLM operates within. The BLM also has general objectives, standards, and guidelines for grazing that preclude managing land solely for maximum livestock production.

## Alternative A

Implementation of this alternative would result in a continuation of impacts similar to those currently occurring. (Many of the effects from continued intensive livestock grazing are covered in the Effects on Water Resources, Wetlands, Soils, Vegetation, Fish and Wildlife, Recreation, and Visual Resources sections for Alternative A. Please refer to those sections for additional impact analysis). Managing existing levels of grazing on the Wood River property over the long term would add substantially to the BLM's grazing administrative workload as it would increase the number of AUMs licensed by the Klamath Falls Resource Area up to 50 percent, with commensurate increases in the range improvement and use supervision workloads. A positive effect would be the addition of significant amount of grazing use to the Resource Area's grazing base, with accompanying revenues to the government, and a continuation of financial benefits to local livestock producers.

BLM regulations and policy preclude grazing public lands at levels higher than its sustained yield capacity. Future rangeland monitoring studies and resultant evaluations of that monitoring data, could and probably would result in changes in authorized grazing levels over the long term. This could be a negative or positive impact depending on whether the grazing use was increased or decreased.

## Alternatives B, C, and D

Livestock grazing would be used solely as a management tool to support the primary goal of wetland restoration, as necessary. Grazing systems, levels,

and duration would be dependent on the need to meet management objectives and could potentially range from current levels, as under Alternative A, down to no livestock use. It is expected that livestock use would be substantially less under Alternatives B, C, and D than under Alternative A.

The primary effect on livestock grazing from implementation of Alternative B, C, or D would be a reduction in grazing use. If no grazing use occurred on the Wood River property, this would result in a reduction of up to 35 percent of the Resource Area's grazing capacity. If no grazing occurred on the property, there could be a long-term loss of up to the equivalent of 2 percent of the gross sales of cattle and calves within Klamath County. Since the cattle that are seasonally grazed on Wood River have historically wintered in California, the two percent figure relates to the amount of forage (7,200 AUMs) that the Wood River property provides compared to the county's total estimated grazing base. This estimated loss is based on an extrapolation of data from the economic analysis found in the Klamath Falls Resource Area Draft Resource Management Plan/Environmental Impact Statement (BLM 1992). If some level of grazing, between zero use and the maximum capacity, takes place on the property, then the economic impacts would be proportional to the amount of use made.

With reduced or no grazing, there would be no need to prepare an allotment management plan or conduct other administrative activities related to livestock grazing. The effects from livestock grazing would be proportional to the amount of use, whether it was at current use levels or no use.

## **Effects on Noxious Weed Management**

See Effects on Vegetation section.

## **Effects on Socioeconomic Conditions**

### **Alternatives A, B, C, and D**

The tax liability of the Wood River property for the 1991-1992 tax year totaled \$8,112 based on an assessed value of \$458,620 (Wood River Ranch appraisals). Under full implementation of Ballot Measure 5, the maximum tax liability at this assessed value would be \$6,985. The BLM was directed by Congress

to dispose of appropriate lands under its control in Klamath County to compensate for this loss in local tax revenues. The BLM will be meeting the Congressional mandate on disposal so there would not be any long-term tax impacts to Klamath County resulting from the BLM's acquisition of the Wood River property.

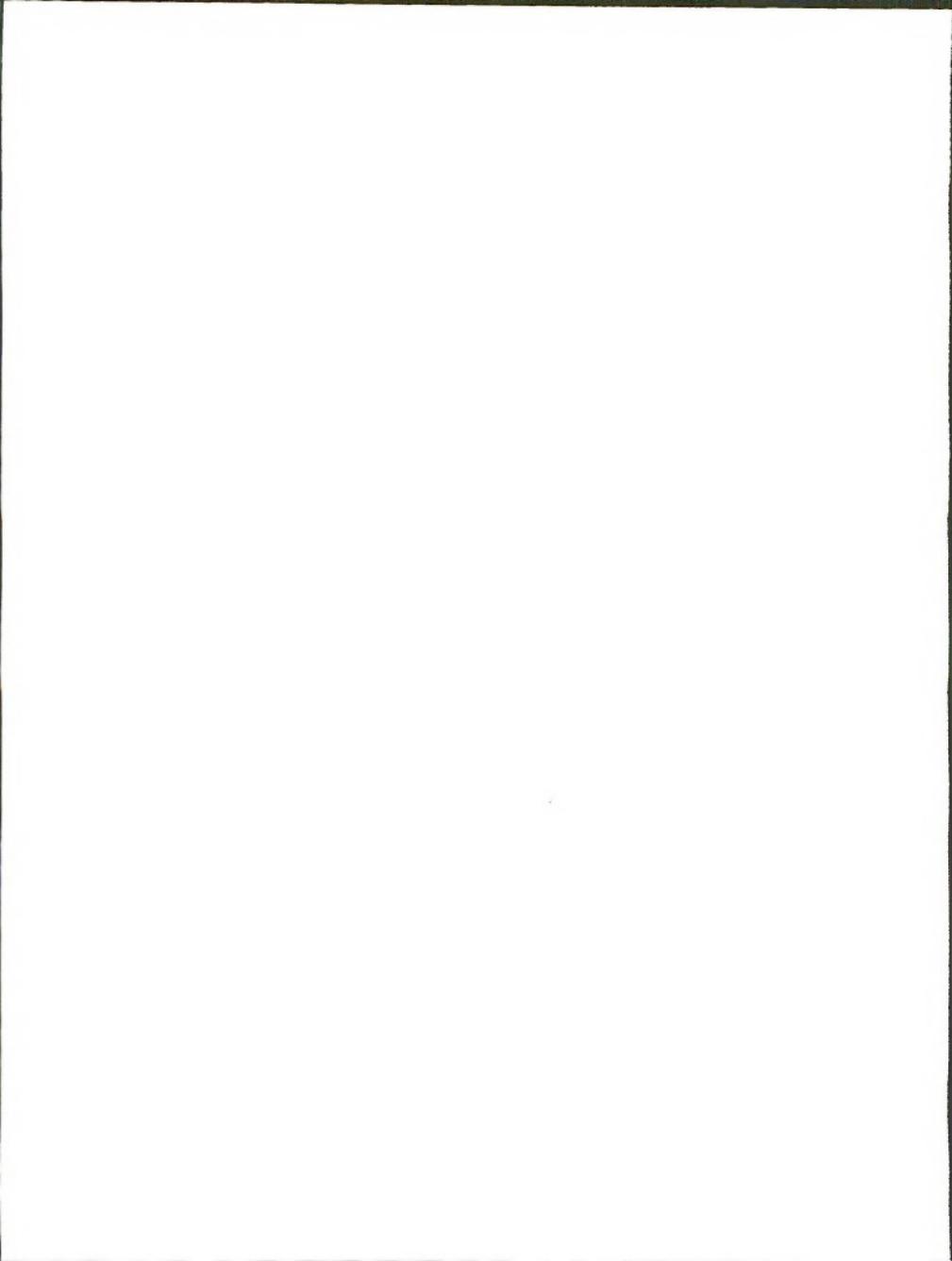
### **Alternative A**

The BLM issued a temporary non-renewable grazing lease for the south half of the property, which expires November 1994, and will lease the north half similarly upon acquisition. The number of AUMs offered is anticipated to be 7,200 which is the same level of use as occurred when the property was privately owned. This level of grazing use would generate approximately \$188,000 of gross agricultural sales, supporting three jobs and \$38,900 of personal income in the local economy.

### **Alternatives B, C, and D**

An economic analysis, conducted by the BLM, estimated a loss of \$188,000 in gross agricultural sales, three jobs, and \$38,900 in personal income from termination of the ranching operation after the BLM's acquisition of the Wood River property (Frewing-Runyon, pers. comm. 1993). Under federal ownership, the Wood River property would be subject to a Payment in Lieu of Taxes (PILT) of \$322, which would be paid to Klamath County in addition to the tax compensation discussed in the previous paragraph.

It is anticipated that one to two additional full-time employees would be needed to manage the property. Additional employment could result from studies and projects performed by other agencies, universities, or groups. Labor for the stream and wetland restoration projects described in Chapter 3 would most likely be done by contract and could last two to four years. Wages paid would be the prevailing rate for heavy equipment operators and other skilled tasks. This increase to local employment would be temporary, would last only until the stream and wetland restoration projects were completed, and is not anticipated to have any long term effect on the local economy.

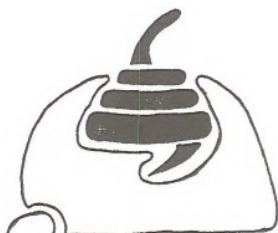


# Chapter 5

## Consultation and Coordination

### Table of Contents

Introduction	5-2
Agencies, Organizations, and Individuals Contacted	5-2
Preparers	5-5



# Introduction

The draft Upper Klamath Basin Resource Management Plan/Environmental Impact Statement (RMP/EIS) was prepared by an interdisciplinary team of specialists from the Klamath Falls Resource Area, with assistance from other federal agencies, state agencies, local groups, and other individuals listed below. Although the actual writing of this draft RMP/EIS began in mid 1993, an elaborate public input process, that began in late 1992, preceded the writing phase. The planning process involved many steps (described in Chapter 1), with public participation, as well as consultation and coordination with many agencies and organizations throughout the process. The public involvement process is summarized in Chapter 1 in the Public Involvement and Wood River Wetland Team sections.

This chapter includes the agencies, organizations, and individuals that were contacted throughout the plan development, as well as those that were sent a copy of this RMP/EIS. Finally, the preparers of the document are listed with their qualifications.

## Agencies, Organizations, and Individuals Contacted

This section is divided into two parts. The first part lists agencies, organizations, and individuals that are on the mailing list under Wood River Wetland Team. They were contacted frequently throughout the planning process. (Wood River Wetland Team members that were actively involved in the process are also listed later in this chapter).

The second part of this section lists agencies, organizations, and individuals that were sent a copy of this draft RMP/EIS. Members of the Wood River Wetland Team were sent the draft RMP/EIS, but they aren't repeated in the second list.

### Wood River Wetland Team

#### Federal Agencies

Department of Agriculture  
U.S. Forest Service  
Soil Conservation Service  
Department of the Interior  
Bureau of Reclamation  
U.S. Fish & Wildlife Service  
U.S. Geological Survey  
Ecosystem Restoration Office

#### Native American Organizations

Klamath Tribe

#### Oregon State Agencies

Department of Environmental Quality  
Department of Fish & Wildlife  
Department of Forestry  
Department of Water Resources

#### Local Government

Klamath County Commissioners  
Klamath County Planning Department  
Klamath County Parks Department

#### Universities

Humboldt State University  
Oregon State University - Extension Office

#### Organizations

American Land Conservancy  
Ducks Unlimited  
Klamath Basin Water Resources Advisory Committee  
Klamath Basin Water Users Protective Association  
Klamath Basin Waterfowl Association  
Klamath Cattlemen's Association  
Klamath River Fisheries Restoration Office  
Meadows Drainage District  
Oregon Watershed Improvement Coalition  
Oregon Natural Resources Council  
Pacific Forest & Basin Rangelands System  
The Nature Conservancy  
Tulana Farms  
Water for Life

**Individuals/Landowners**  
Sherman & Betty Anderson  
Robert F. Brown  
Fred Dawson  
Leonard & Linda Garrison  
Don Haglund (Running Y Ranch)  
Ron Hahn  
Gerald Hawkins  
Velma Johnson (Agency Ranch)  
Ambrose & Susan McAuliffe  
Kurt & Melinda Thomas  
Carroll E. Thomas  
Donovan C. Zupan

## Other Agencies, Organizations, and Individuals Sent Draft RMP/EIS

### Federal Agencies

Department of Defense  
U.S. Air Force  
U.S. Army Corps of Engineers  
Department of Energy  
Bonneville Power Administration  
Department of the Interior  
Bureau of Indian Affairs  
Bureau of Land Management  
Bureau of Mines  
Minerals Management Service  
Natural Resources Library  
National Park Service  
Office of Environmental Project Review  
Office of Public Affairs  
Department of Transportation  
Environmental Protection Agency  
Lava Beds National Monument  
National Marine Fisheries Service  
National Oceanic & Atmospheric Administration

### Federal and State Elected Representatives

Honorable Mark O. Hatfield  
Honorable Robert Packwood  
Honorable Robert L. Smith  
Oregon Representative D.E. Jones  
Oregon Representative Dennis Luke  
Oregon Representative Del Parks  
Oregon Senator Eugene Timms  
Oregon Senator Neil Bryant

### Native American Organizations

Hoopa Valley Tribe  
Karuk Tribe of California

### Oregon State Agencies

Governor Barbara Roberts  
Department of Agriculture  
Department of Economic Development  
Department of Energy  
Department of Geology and Mineral Industries  
Department of Justice  
Department of Land Conservation and Development  
Department of Parks and Recreation  
Department of Transportation  
Employment Division  
Governors Forest Planning Team  
Historical Preservation Office  
Legal Services  
Marine Board  
Office of the Governor  
Public Utilities Commission  
State Economist

### Local Government

City of Klamath Falls  
Klamath County  
Libraries  
Department of Public Works  
Chamber of Commerce  
Economic Development  
Extension Service  
Historical Society  
School District  
Solid Waste Management  
Soil & Water Conservation  
Shasta County Library

### Universities

Oregon Institute of Technology  
Oregon State University Library

### Organizations

American Rivers, Inc.  
Audubon Society of the Klamath Basin  
Friends of the River  
Herald & News  
KAGO AM & FM 99  
KBOY AM/FM  
KDKF-TV  
KDRV-TV  
KFLS/KKRB  
KLAD Radio  
KOTI-TV  
KTVL-10 Medford  
Klamath River Compact  
Native Plant Society  
Natural Resources Defense Council

**Organizations (continued)**

Oregon Institute of Technology  
Oregon Natural Desert Association  
Oregonian  
Oregon Waterfowl & Wetlands Association  
Pacific Power and Light  
Pacific Rivers Council  
Resource Management International  
Sierra Club  
Siskiyou Daily News  
Tulelake Irrigation District  
Western Aquatic Turtle Research Consortium  
Wetlands Conservancy  
Weyerhaeuser Company  
Wilderness Society

**Individuals**

Edward L. Britton  
Brian & Danita Brown  
Mike Byrne  
Philip C. Dimick  
William Grund  
Anthony Hardian  
Robert & Norma Hill  
Francis Landrum  
Christina Lileenthal  
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Chester & Anita Mann  
Laurie Martin  
Ed Miranda, Sr.  
Ronald K. Rima  
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Dick Varien  
Rob Wampler  
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# Preparers

## PREPARERS (continued)

Name	Position/Responsibilities	Qualification
<b>Management</b>		
A. Barron Bail	Klamath Falls Resource Area Manager; Management Guidance	B.S., Range-Forest Management, Colorado State University; BLM, 15 years.
Charles R. Graham	Lakeview District Manager and Fremont National Forest Supervisor; Management Guidance	Bachelor of Science, University of Montana; Forest Service-Region 6, 31 years.

## BLM Interdisciplinary Team (Document Preparers)

Kristin Bail	District Hydrologist; BLM Liaison to Klamath Basin Ecosystem Restoration Office, Soils, Water Resources, and Wetlands	B.S., Geology, Washington State University; BLM, 9.5 years.
Susan Bond	Editorial Assistant; Typesetting/ Document Production, Data Processing	Private Industry, 5 years; BLM, 3 years.
Tom Cottingham	Realty Specialist; Lands, Rights-of-Way, Access.	B.S., Wildlife Management, Humboldt State University; Post Graduate Work at Humboldt State University. BLM, 15 years; FWS, 6 months.
Joe Foran	Fuels Management Specialist; Fire Management, Air Quality	A.A., Wood Industries Technician, Southwestern Oregon Community College. BLM, 21 years; USFS, 1 year.
Leslie Frewing-Runyon	State Office Economist; Socioeconomics	B.A., Economics, Willamette University; BLM 3 years.
Ron Hicks	Wildlife Biologist; Fish and Wildlife Habitat, Special Status Species (Fish and Wildlife)	Wildlife Management, Humboldt State University; BLM, 7 years; USFWS, 2 years; NMFS, 1 year; NPS, 1 year; Private, 1 year; USFS, 2 years.
Cathy Humphrey	Team Leader; Document Production, Public Involvement, Wild & Scenic Rivers	B.S. Geology, New Mexico State University. BLM, 13 years.

**PREPARERS (continued)**

Name	Position/Responsibilities	Qualification
<b>BLM Interdisciplinary Team (Document Preparers) (continued)</b>		
Bill Lindsey	Range Conservationist; Livestock Grazing	B.S., Range Resource Management, Oregon State University. BLM, 15 years; USCG, 4 years; USFS, 3 months; ODFW, 3 months.
Brian McCarty	Civil Engineering Technician; Road Management	A.A.S. Vermilion Community College, Ely, Minnesota; Heavy Equipment Operation, Missoula Vo- Tech; BLM, 12 years; USFS, 1 year
V. Scott Senter	Outdoor Recreation Planner; Recreation and Visual Resources	B.S., Forest Management, University of Washington. BLM, 14 years; BIA, 1 year.
Dennis Simontacchi	District Geologist; Energy and Minerals	B.A., Geology, University of California. BLM, 18 years; USBR, 6 years.
Gayle Sitter	Wildlife Biologist; Fisheries, Special Status Species	B.S., Wildlife Management, University of Minnesota. M.S., Wildlife Resources, University of Idaho. BLM, 15 years; USGS, 6 months; USFS, 2 years; State, 5 years.
Jim Vienop	Writer/Editor; Document Production, Technical Coordination, Editing	B.A., Biology, Humboldt State University. Peace Corps, 2.5 years; BLM, 3 years.
Louis Whiteaker	Botanist; Special Status Plants, Vegetation, Noxious Weeds, Special Areas	B.S., Finance, University of Southern California; M.S., Botanical Sciences, University of Hawaii. BLM, 3 years; NPS, 3 years; Research Assistant, Stanford University, 2 years; Research Assistant, University of Hawaii, 5 years.
Bill Yehle	Archeologist; Cultural Resources	B.A., Anthropology and History, and M.A., Cultural Resource Management, Boise State University; BLM, 1 year; USFS, 6 months; Private Consultant, 12 years.

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**PREPARERS (continued)**

Name	Position/Responsibilities	Qualification
<b>Other Contributors</b>		
Michael Bechdolt	Manager Timber Resources; Document Review	B.S., Forest Management, Humboldt State University; BLM, 15 years
Judy Briney	Supervisory Cartography Technician	BLM State Office, Staff Support
William Dean	Special Status Species Wildlife Biologist; Document Review	A.A.S., Natural Resources Conservation and A.S. Environmental Science & Forestry, Community College of the Finger Lakes; B.S., Wildlife Biology, Colorado State University; BLM, 4 years.
William D. Johnson	Silviculturist; Document Review	B.S., Forest Management, University of Minnesota. BLM, 22 years.
Cliff McClelland	Printing Specialist	BLM State Office, Office Services
Rob McEnroe	Plans and GIS Forester; GIS	B.S., Forestry, University of Montana. BLM, 14 years; USFS, 3 years.
Grant Morrison	Cartography Technician	BLM State Office, Staff Support
Corey Plank	Cartographer	BLM State Office, Staff Support
Lisa Regan	Artwork	

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**PREPARERS (continued)**

Name	Title	Affiliation
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## Wood River Wetland Team Participants

### Federal Agencies

Bob Castaneda	Forest Supervisor	Winema National Forest
Jim Hainline	Wildlife Biologist	U.S. Fish and Wildlife Service-Klamath Basin National Wildlife Refuge
Steve Lewis	Supervisor	Klamath Basin Ecosystem Restoration Office
Eric Stiles	Environmental Engineer	Bureau of Reclamation, Denver

### State Agencies

John Fortune	District Fish Biologist	Oregon Department of Fish and Wildlife
Ralph Opp	District Wildlife Biologist	Oregon Department of Fish and Wildlife
Roger Smith	Assistant Fish Biologist	Oregon Department of Fish and Wildlife
Del Sparks	Klamath Basin Water Master	Oregon Department of Water Resources

### Local Agencies

Keith Read	Parks & Solid Waste Supervisor	Klamath County Parks Department
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### Organizations

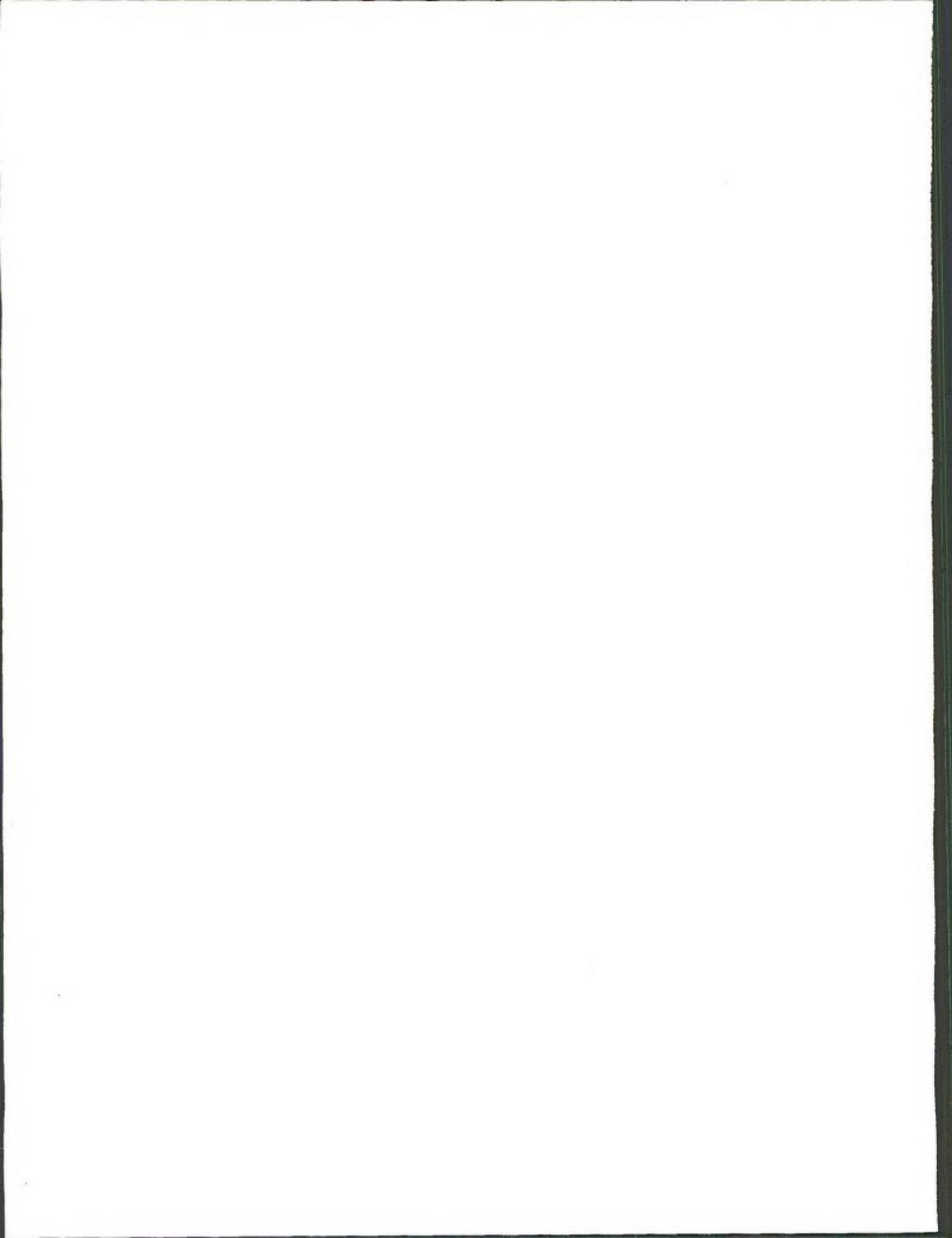
L. Frank Goodson	President	Klamath Basin Waterfowl Association
	Boardmember	Klamath Basin Water Resources Advisory Committee
Don Hagglund	Manager; Director	Running Y Ranch; Klamath Cattlemen's Association

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**PREPARERS (continued)**

Name	Title	Affiliation
<b>Organizations (continued)</b>		
Jake Kann	Aquatic Ecologist	Klamath Tribe
Rocky Liskey	President	Klamath Cattlemen's Association
Rich McIntyre	Project Director	Klamath Basin Water Resources Advisory Committee
Karl Wenner	WRWT Representative	Klamath Basin Water Resources Advisory Committee
David Zepponi	Executive Director	Klamath Basin Water User Protective Association
<b>Universities</b>		
Margaret Forbes	Graduate Student	Humboldt State University Department of Engineering
Dr. Bob Gearhart	Professor of Environmental Engineering	Humboldt State University Department of Engineering
Rodney Todd	County Extension Agent	Oregon State University, Extension Office
<b>Individuals</b>		
Sherm & Betty Anderson		
Velma Johnson		
Suma Shaazmunda		

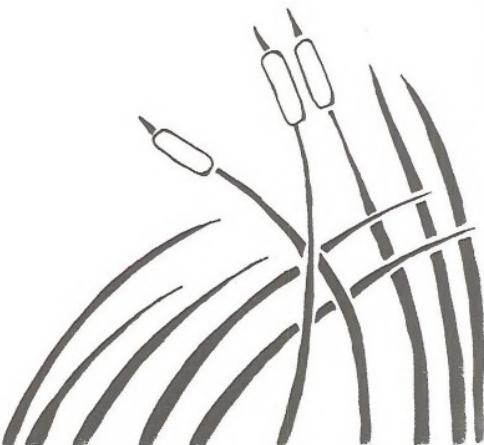
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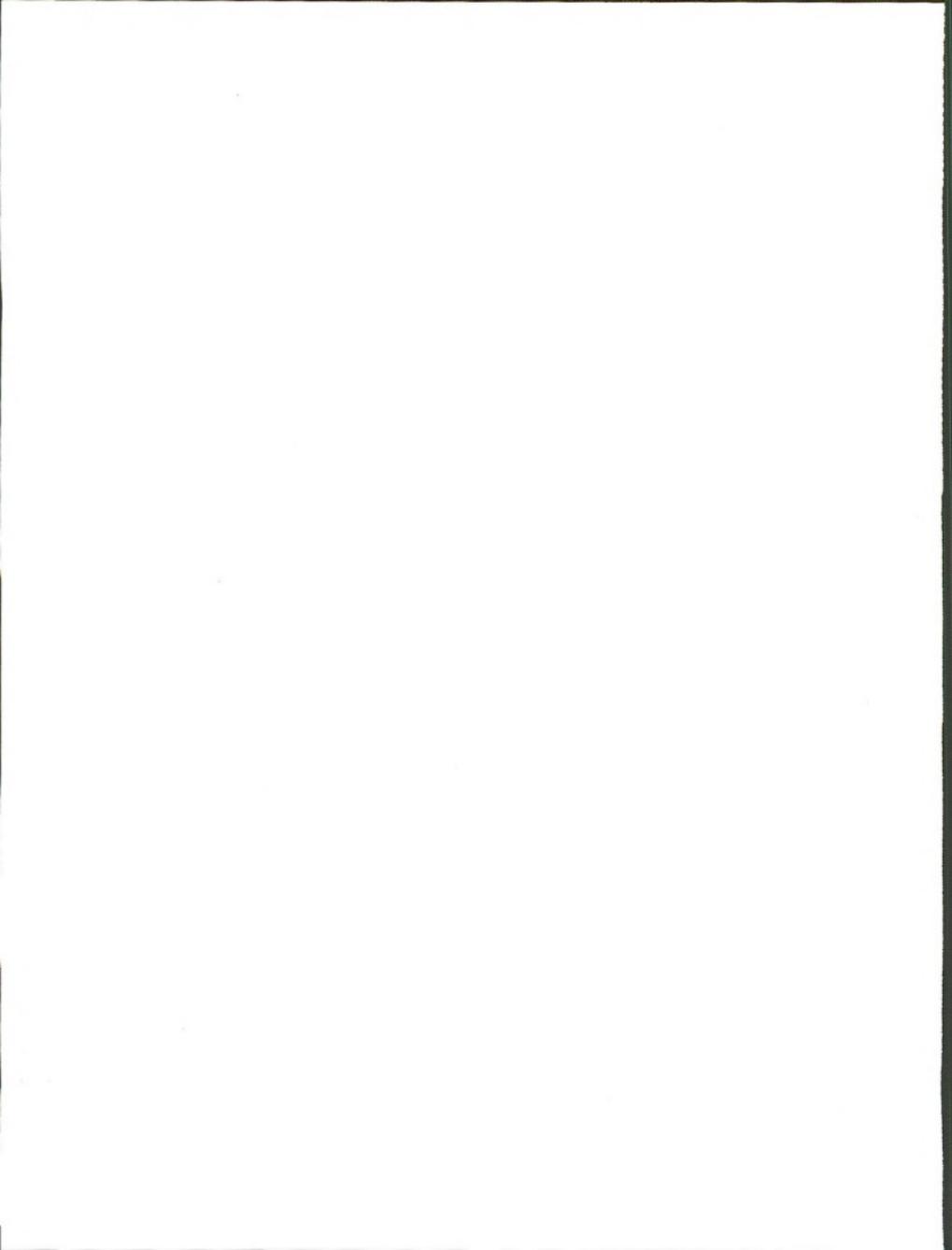


# Appendices

## Table of Contents

Appendix 1 - Plant Species on Wood River Property	Apx-1
Appendix 2 - Wildlife Species on Wood River Property	Apx-3
Appendix 3 - Wood River Wetland Plan Monitoring	Apx-7
Appendix 4 - Wood River Potential Area of Critical Environmental Concern Evaluation	Apx-17
Appendix 5 - Wild and Scenic River Eligibility Determinations	Apx-23
Appendix 6 - Water Resources, Wetland Functions	Apx-25
Appendix 7 - Stream Channel and Wetland Restoration Options	Apx-31





# Appendix 1

## Plant Species on Wood River Property

### Introduction

The following preliminary list of plant species was developed by a Klamath Falls Resource Area botanist after a brief survey of the Wood River property. Because this initial survey was brief, and conducted during one season, not all plant species were identifiable. This list will be updated as new information is gathered.

### Wood River Property Preliminary Plant Species List

Common Name	Scientific Name
Yarrow	<i>Achillea millefolium</i>
Idaho Bentgrass	<i>Agrostis idahoensis</i>
Shortawn Foxtail	<i>Alopecurus aequalis</i>
Meadow Foxtail	<i>Allopecurus pratensis</i>
Douglas' Sagebrush	<i>Artemesia douglasiana</i>
Aster	<i>Aster</i> sp.
Nodding Beggars-tick	<i>Bidens cernua</i>
Cheatgrass	<i>Bromus tectorum</i>
Shepard's Purse	<i>Capsella bursa-pastoris</i>
Beaked Sedge	<i>Carex utriculata</i>
Pitseed Goosefoot	<i>Chenopodium berlandieri</i>
Bull Thistle	<i>Cirsium vulgare</i>
Tufted Hairgrass	<i>Deschampsia cespitosa</i>
Willow Herb	<i>Epilobium ciliatum</i> var. <i>ciliatum</i>
Quackgrass	<i>Elytrigia repens</i> ( <i>Agropyron r.</i> )
Bedstraw	<i>Galium</i> sp.
Managrass	<i>Glyceria borealis</i>
Cudweed	<i>Gnaphalium palustre</i>
Meadow Barley	<i>Hordeum brachyantherum</i>
Foxtail Barley	<i>Hordeum jubatum</i>
Nevada Rush	<i>Juncus nevadensis</i>
Rush	<i>Juncus</i> sp.
Prickly Lettuce	<i>Lactuca serriola</i>
Clasping Pepperweed	<i>Lepidium perfoliatum</i>
Duckweed	<i>Lemna minor</i>
Dwarf Lupine	<i>Lupinus lepidus</i>
Lupine	<i>Lupinus</i> sp.
Cluster Tarweed	<i>Madia glomerata</i>
Pineapple Weed	<i>Matricaria matricarioides</i>
Sweet Clover	<i>Melilotus officinalis</i>
Wocus, Spatterdock	<i>Nuphar polysepala</i>

## Wood River Property Preliminary Plant Species List (continued)

Common Name	Scientific Name
Nemophila	<i>Nemophila pedunculata</i>
Canary Reed-grass	<i>Phalaris arundinacea</i>
Common Knotweed	<i>Polygonum aviculare</i>
Douglas' Knotweed	<i>Polygonum douglasii</i>
Knotweed	<i>Polygonum sp.</i>
Rabbitfoot Grass	<i>Polygopogon monspeliensis</i>
Kentucky Bluegrass	<i>Poa pratensis</i>
Bluegrass	<i>Poa sp.</i>
Black Cottonwood	<i>Populus trichocarpa</i>
Swamp Currant	<i>Ribes lacustre</i>
Curly Dock	<i>Rumex crispus</i>
Golden Dock	<i>Rumex maritimus</i>
Dock	<i>Rumex sp.</i>
Willow	<i>Salix sp.</i>
Marsh Skullcap	<i>Scutellaria galericulata</i>
Hardstem Bulrush	<i>Scirpus acutus</i>
Tumble Mustard	<i>Sisymbrium altissimum</i>
Bitter Nightshade	<i>Solanum dulcamara</i>
Broadfruited Bur-reed	<i>Sparganium eurycarpum</i>
Hedge Nettle	<i>Stachys rigida</i>
Fan-weed	<i>Thlaspi arvense</i>
Western Salsify	<i>Tragopogon dubius</i>
Alsike Clover	<i>Trifolium hybridum</i>
White Clover	<i>Trifolium repens</i>
Common Cattail	<i>Typha latifolia</i>
Hoary Nettle	<i>Urtica dioica ssp. holosericea</i>
Common Mullein	<i>Verbascum thapsis</i>

# Appendix 2

## Wildlife Species on Wood River Property

### Introduction

This appendix contains a list of the wildlife (terrestrial, aquatic, and avian) suspected and/or documented as occurring on the Wood River property. The list may not be complete and will be updated as information becomes available.

### Wood River Property Preliminary Wildlife Species List

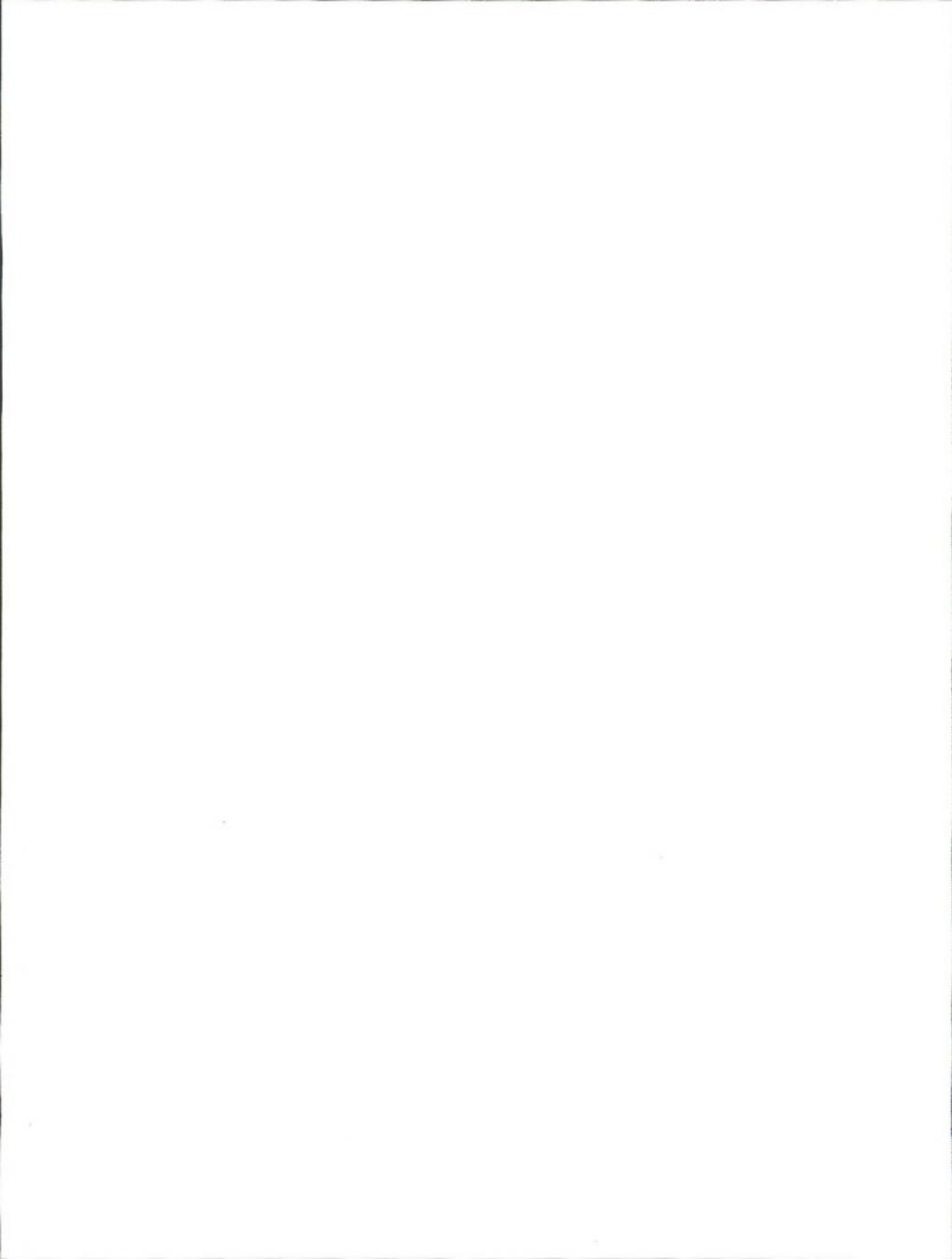
Long-toed Salamander	Small-footed Myotis	Western Red-backed Vole
Clouded Salamander	Silver-haired Bat	Muskrat
Rough-skinned Newt	Western Pipistrel	House Mouse
Western Toad	Big Brown Bat	Norway Rat
Pacific Tree Frog	Hoary Bat	Western Jumping Mouse
Bullfrog	Pallid Bat	Pacific Jumping Mouse
Spotted Frog	Townsend's Big-eared Bat	Porcupine
Cascades Frog	Mountain Cottontail	Coyote
Western Pond Turtle	Nuttall's Cottontail	Black Bear
Western Fence Lizard	Snowshoe Hare	Ringtail
Short-horned Lizard	White-tailed Jackrabbit	Raccoon
Northern Alligator Lizard	Black-tailed Jackrabbit	Marten
Sagebrush Lizard	Least Chipmunk	Fisher
Western Skink	Yellow Pine Chipmunk	Mink
Rubber Boa	Yellow-bellied Marmot	Long-tailed Weasel
Ringneck Snake	Belding Ground Squirrel	Short-tailed Weasel
Yellow-bellied Racer	Golden-mantled Ground Squirrel	Badger
Gopher Snake	California Ground Squirrel	Spotted Skunk
Common Garter Snake	Western Gray Squirrel	Striped Skunk
Western Terrestrial Garter Snake	Douglas Squirrel (Chickaree)	River Otter
Western Rattlesnake	Northern Flying Squirrel	Mountain Lion
Merriam Shrew	Northern Pocket Gopher	Bobcat
Vagrant Shrew	Mazama Pocket Gopher	Elk
Trowbridge Shrew	Beaver	Mule Deer
Northern Water Shrew	Western Harvest Mouse	Pronghorn
Water Shrew	Canyon Mouse	Western Grebe
Broad-footed Mole	Deer Mouse	Eared Grebe
Little Brown Myotis	Bushy-tailed Woodrat	Pied-billed Grebe
Yuma Myotis	Dusky-footed Woodrat	American White Pelican
Long-eared Myotis	Sagebrush Vole	Double-crested Cormorant
Fringed Myotis	Mountain Vole	American Bittern
Long-legged Myotis	Long-tailed Vole	Black-crowned Night Heron
California Myoti		

## Wood River Property Preliminary Wildlife Species List (continued)

Great Egret	American Kestrel	Cliff Swallow
Great Blue Heron	Prairie Falcon	Bank Swallow
White-faced Ibis	Peregrine Falcon	Northern Rough-winged Swallow
Sandhill Crane	Sage Grouse	Barn Swallow
Tundra Swan	California Quail	Scrub Jay
Greater White-fronted Goose	Mountain Quail	Stellar's Jay
Snow Goose	Chukar	Clark's Nutcracker
Ross' Goose	Red-legged Partridge	Black-billed Magpie
Canada Goose	Blue Grouse	Common Raven
Mallard	Ring-necked Pheasant	American Crow
Gadwall	Wild Turkey	Black-capped Chickadee
Green-winged Teal	Rock Dove	Mountain Chickadee
American Wigeon	Mourning Dove	Plain Titmouse
Northern Pintail	Common Barn Owl	Bushtit
Northern Shoveler	Short-eared Owl	Brown Creeper
Blue-winged Teal	Long-eared Owl	White-breasted Nuthatch
Cinnamon Teal	Great-horned Owl	Red-breasted Nuthatch
Ruddy Duck	Western Screech Owl	Pygmy Nuthatch
Wood duck	Great Gray Owl	House Wren
Canvasback	Northern Pygmy Owl	Marsh Wren
Redhead	Northern Saw-whet Owl	Canyon Wren
Ring-necked Duck	Spotted Owl	Rock Wren
Lesser Scaup	Vaux's Swift	Bewick's Wren
Barrow's Goldeneye	Common Nighthawk	Ruby-crowned Kinglet
Bufflehead	Anna's Hummingbird	Golden-crowned Kinglet
Common Merganser	Calliope Hummingbird	Swainson's Thrush
Virginia Rail	Rufous Hummingbird	Blue-gray Gnatcatcher
Sora	Belted Kingfisher	Hermit Thrush
American Coot	Northern Flicker	American Robin
American Avocet	White-headed Woodpecker	Varied Thrush
Black-necked Stilt	Lewis' Woodpecker	Western Bluebird
Killdeer	Acorn Woodpecker	Mountain Bluebird
Willet	Williamson's Sapsucker	Townsend's Solitaire
Greater Yellowlegs	Red-naped Sapsucker	Wrentit
Spotted Sandpiper	Red-breasted Sapsucker	Loggerhead Shrike
Wilson's Phalarope	Downy Woodpecker	Northern Shrike
Common Snipe	Hairy Woodpecker	Water Pipit
Ring-billed Gull	Black-backed Woodpecker	American Dipper
California Gull	Pileated Woodpecker	Cedar Waxwing
Forster's Tern	Western Kingbird	European Starling
Black Tern	Ash-throated Flycatcher	Solitary Vireo
Caspian Tern	Olive-sided Flycatcher	Warbling Vireo
Turkey Vulture	Western Wood-peewee	Orange-crowned Warbler
Golden Eagle	Say's Phoebe	Nashville Warbler
Bald Eagle	Hammond's Flycatcher	Yellow-rumped Warbler
Northern Harrier	Gray Flycatcher	Townsend's Warbler
Sharp-shinned Hawk	Dusky Flycatcher	Yellow Warbler
Cooper's Hawk	Willow Flycatcher	MacGillivray's Warbler
Northern Goshawk	Western Flycatcher	Wilson's Warbler
Red-tailed Hawk	Horned Lark	Common Yellowthroat
Rough-legged Hawk	Tree Swallow	Black-headed Grosbeak
Osprey	Violet-green Swallow	Lazuli Bunting

## Wood River Property Preliminary Wildlife Species List (continued)

Green-tailed Towhee  
Rufous-sided Towhee  
California Towhee  
Vesper Sparrow  
Brewer's Sparrow  
Savannah Sparrow  
Black-chinned Sparrow  
Song Sparrow  
Chipping Sparrow  
White-crowned Sparrow  
Golden-crowned Sparrow  
Fox Sparrow  
Dark-eyed Junco  
Lincoln's Sparrow  
Lark Sparrow  
Western Meadowlark  
Yellow-headed Blackbird  
Brewer's Blackbird  
Red-winged Blackbird  
Tri-colored Blackbird  
Brown-headed Cowbird  
Northern Oriole  
Western Tanager  
House Sparrow  
Pine Siskin  
American Goldfinch  
Lesser Goldfinch  
Red Crossbill  
Purple Finch  
Cassin's Finch  
House Finch  
Evening Grosbeak



# Appendix 3

## Wood River Wetland Plan Monitoring

### Introduction

The BLM planning regulations (43 CFR 1610.4-9) call for monitoring and evaluating resource management plans at appropriate intervals. The purposes of monitoring and evaluating the Upper Klamath Basin Resource Management Plan/Environmental Impact Statement (RMP/EIS) are to:

- \* Track progress of RMP implementation and assure that activities are occurring in conformance with the plan (implementation monitoring);
- \* Determine if activities are producing the expected results and meeting stated objectives (effectiveness monitoring); and
- \* Determine if activities are causing the effects identified in the EIS (validation).

Implementation of the RMP will be monitored to ensure that management actions are being implemented and are meeting their intended purposes. Specific management actions will be compared with RMP objectives to ensure consistency with the intent of the plan.

Some effectiveness monitoring and most validation can only be accomplished by formal research. Monitoring will be conducted as specified in the following sections, and the results will be reported in an Annual Program Summary, along with monitoring results from the RMP for the rest of the Klamath Falls Resource Area. This annual summary will be published starting the second year following initial implementation of the RMP. The Annual Program Summary will serve as a report to the public, track and assess the progress of plan implementation, and state the findings made through monitoring. For the Upper Klamath Basin portion of the program summary, the BLM will determine if:

- \* management actions are resulting in satisfactory progress toward achieving RMP objectives;
- \* management actions are consistent with current policy;
- \* original assumptions are valid and impacts are within the range predicted, given the reliability of the predictions;
- \* mitigation and corrective measures are satisfactory and serving their purposes;
- \* the RMP is still consistent with the plans and policies of state or local government, other federal agencies, and the Klamath Tribe;
- \* new data are available that could result in alteration or amendment of the plan;
- \* requirements of the National Environmental Policy Act are being met; and
- \* compliance is being achieved on actions authorized by the BLM.

### **Appendix 3 - Wood River Wetland Plan Monitoring**

Where relevant, monitoring will follow written standards for sampling design, parameters to be monitored, analytical techniques, statistical methods for data analysis, and reporting units.

Involvement of other interested parties and agencies in monitoring of plan implementation will be encouraged. This may entail coordinated monitoring efforts with parties that are able to fund their own participation in such efforts. The Wood River Wetland Team will assist with determining monitoring and research needs and priorities.

This monitoring plan is not static. During the life of the RMP the monitoring plan itself will be periodically evaluated to ascertain that the monitoring questions and standards remain relevant, and will be fine-tuned as appropriate.

This appendix is based on the monitoring appendix in the Klamath Falls Resource Area's 1992 draft Resource Management Plan/Environmental Impact Statement (RMP/EIS), and will be modified to correspond with the updated monitoring plan in the KFRA's final RMP/EIS.

## **Air Quality**

### **Expected Future Conditions and Outputs**

Compliance with the Oregon Smoke Management Plan and the State Implementation Plan, to help meet established air quality standards in accordance with the Clean Air Act.

### **Monitoring Questions**

- \* Are management practices achieving the goal of complying with the Oregon Smoke Management Plan and State Implementation Plan?
- \* Are BLM prescribed fires contributing to intrusions into Class I areas? How frequently do intrusions occur?
- \* Of intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences?

## **Standards**

- \* Using the Oregon Smoke Management Annual Report and any BLM smoke surveillance reports, the number of intrusions BLM certainly or possibly contributed to will be determined annually. The percentage of total units burned that contributed (or might have) to such intrusions will be calculated.
- \* Reported intrusions will be individually investigated to determine the most probable cause and establish possible corrective measures.

## **Costs**

An estimated \$500 annually.

# Soil Productivity

## Expected Future Conditions and Outputs

Soils will be managed to maintain long-term site productivity by avoiding or minimizing compaction/displacement, and surface erosion.

## Monitoring Question

- \* Are management practices achieving the goal of maintaining long-term site productivity?

## Standards

There are two components of the soil resource which will be monitored to answer the monitoring question.

- \* Compaction.
  - Implementation of best management practices (BMPs) to minimize compaction will be monitored for all surface disturbing activities.
  - Effectiveness of practices to minimize compaction will be monitored for one soil disturbing project per year. Compaction will be assessed by establishing post treatment transects (such as a pace transect) and determining the extent of compacted areas. Results will be reported as the percent of area that is compacted.
- \* Surface Erosion.
  - Implementation of BMPs to minimize surface erosion will be monitored for all surface disturbing activities.
  - Effectiveness of practices to minimize surface erosion will be monitored for one soil disturbing project per year. Information will be qualitative and obtained by visual, professional estimate immediately after project completion and again two years later. If information indicates unacceptable erosion rates, the soil scientist/hydrologist should use a standard procedure to quantify the rate of erosion.

## Costs

An estimated \$2,000 annually.

## Water Resources

### Expected Future Conditions and Outputs

Restore the Wood River property to its previous form and function as a wetland community within the unalterable constraints (such as elevation, existing dikes, water rights, land ownership patterns, and funds). Long-term improvements in water quality entering Agency Lake would be targeted, but short-term localized reductions could occur. Water use will be compatible with Oregon State laws. The Wood River Wetland Team will help determine monitoring and research needs and priorities on an ongoing basis.

### Monitoring Questions

- \* What is the quality of the water entering Agency Lake from the Wood River property? Is the quality improved, reduced, or the same as the quality of water that was pumped off of the property prior to BLM acquisition?
- \* Is water use in compliance with state laws?
- \* Are site-specific Best Management Practices (BMPs) incorporated in project design and correctly applied?
- \* Are applied BMPs achieving water resource objectives?
- \* Are applied BMPs effective in maintaining or improving water quality consistent with basin-specific water quality criteria for protection of recognized beneficial uses?
- \* Are watershed cumulative effects at or below the levels anticipated in the RMP/EIS and project-specific environmental assessments (EAs).
- \* Are objectives for the biological, chemical, and physical functions of the wetland ecosystem being met?

### Standards

- \* All management activities using BMPs will be monitored to determine whether BMPs are incorporated in the project design and correctly applied. This will be accomplished primarily through contract administration. Effectiveness monitoring will be designed to achieve statistical validity and will incorporate established standard monitoring methods. Selection of locations and water quality parameters for BMP effectiveness monitoring will consider beneficial use(s) likely to be affected, BMPs being applied, and water quality criteria necessary to protect beneficial use(s).
- \* A minimum of one surface disturbing activity per year will be monitored to determine whether the BMP objectives for water resources are being met.
- \* Monitoring to determine effectiveness of BMPs in meeting water quality criteria will be conducted as determined necessary.
- \* All water bodies that are within or adjacent to an area treated with herbicide and support a beneficial use will be monitored to determine effectiveness of BMPs in meeting water quality criteria.
- \* Water quality sampling will continue.

### Costs

An estimated \$10,000 annually.

# Riparian Zones

## Expected Future Conditions and Outputs

Riparian management areas (RMAs) will be managed to protect stream ecosystem functions and riparian zones, and to maintain or improve riparian habitat for wildlife, fish, and for native plant diversity.

## Monitoring Questions

- \* Are RMP-approved disturbances (for example, stream channel restoration) within riparian zones meeting standards identified in the RMP/EIS? Are BMPs being implemented when and where appropriate and are these BMPs meeting their objectives?

## Standards

- \* Management activities will be monitored, on a case-by-case basis, to determine if BMP standards are being met. Monitoring of riparian zone condition will occur periodically to identify any unanticipated impacts resulting from management activities, such as excessive erosion and prescribed fire. The information obtained from monitoring will be used in evaluations and in the development of mitigating measures and BMPs. Riparian zones will be periodically monitored to determine if stream banks are being maintained in stable condition along at least 90 percent of the stream's length.

## Costs

An estimated \$3,000 annually.

# Wildlife Habitat

## Expected Future Conditions and Outputs

Wildlife habitat will be managed for diversity with the necessary quantity and quality to maintain or enhance species currently using the property or species that would use the property if suitable habitat was available.

## Monitoring Questions

- \* Are the shrub and tree clumps planted on the dikes providing the quantity and quality of habitat necessary for nesting and migrating neotropical migratory birds?
- \* Are the vegetative management techniques (such as water control, grazing, and prescribed fire) meeting the objectives of creating and maintaining habitat diversity?
- \* Has placement of nesting structures (such as islands, boxes, poles, and tree plantings) met the needs of raptors and waterfowl?

## **Standards**

- \* Inventories to measure the quantity and quality of existing habitats will be conducted. After major habitat manipulations are completed another inventory to measure habitat change will be initiated.
- \* Baseline monitoring for neotropical migratory bird use will be conducted annually for several years and at intervals of at least once every five years thereafter. If particular management actions take place that may have an impact (positive or negative) on neotropical migratory birds, then monitoring to determine trend will take place.
- \* Baseline monitoring to establish presence and relative abundance of wildlife species will be conducted prior to any significant habitat manipulation (for example, wetland creation/enhancement and nest island construction). After each habitat manipulation, monitoring to measure change will be conducted.

## **Cost**

An estimated \$5,000 per year for the first three years of baseline monitoring and \$3,000 per year for each additional year of monitoring.

## **Fish Habitat**

### **Expected Future Conditions and Outputs**

Maintenance and enhancement of fish habitat with diversity and quality capable of maintaining or enhancing populations of resident and spawning trout and shorthose and Lost River suckers. Improvement of rearing habitat and increasing habitat structures in the streams and lake front.

## **Monitoring Questions**

- \* Is quantity and quality of rearing and instream fish habitat being maintained or improved as predicted?
- \* Are the habitat structures meeting the needs of fish populations?
- \* Are the riparian and habitat improvements meeting fish habitat needs? (This will be monitored in conjunction with riparian monitoring objectives.)

## **Standards**

- \* Wood River and Sevenmile Creek will be sampled every five years for changes in riparian and instream habitat conditions and fish populations.

## **Costs**

An estimated \$2,000 annually, plus initial costs for equipment of \$3,000.

## **Special Status Species**

### **Expected Future Conditions and Outputs**

Conservation or recovery of special status species and their habitats so that listing under the Endangered Species Act (ESA) is not needed.

### **Monitoring Questions**

- \* Are BLM actions and BLM authorized actions designed and executed to protect or enhance special status species and/or their habitat to the extent required by the ESA, Bureau policy, or as directed in the RMP?
- \* Are the mitigation and protection measures employed effective?

### **Standards**

- \* Each year's project files will be reviewed annually to evaluate related recommendations and decisions regarding special status species and in light of ESA requirements, policy, and RMP decisions. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and if mitigation was carried out as planned on the ground.
- \* Habitat conditions will be monitored at all or a representative sampling of known sites of all listed, proposed, candidate, State listed, and Bureau sensitive plant and animal species identified as occupying sites potentially affected by Bureau actions, both before and within a year after site disturbance and/or at intervals of at least five years. Population trends of plants in those categories at such sites will also be monitored. Such monitoring will specifically evaluate effectiveness of mitigating measures.

### **Costs**

An estimated \$1,000 annually for the first standard above, and approximately \$1,000 per site each year visited.

## **Area of Critical Environmental Concern (ACEC)**

### **Expected Future Conditions and Outputs**

Maintenance of the ACEC in accordance with the objectives established for it, to protect the values for which it was designated.

### **Monitoring Questions**

- \* Are BLM actions and BLM-authorized actions consistent with RMP objectives for designated ACEC?
- \* Are the special values of the ACEC being maintained?
- \* Has a baseline inventory of relevant values been conducted? What is their present condition?

## **Standards**

- \* All actions within and adjacent to the ACEC will be reviewed to determine whether the possibility of impacts on the ACEC values was considered, and whether any mitigation identified as important for maintenance of ACEC values was required and, if so, was actually implemented.
- \* The ACEC will be monitored annually to determine if unauthorized uses are occurring and whether ACEC values are being maintained.

## **Costs**

An estimated average of \$1,000 annually.

## **Visual Resources**

### **Expected Future Conditions and Outputs**

The Wood River property is in a highly modified condition and are currently estimated to be in Visual Resource Management (VRM) Class IV condition. In the long term, the Wood River property would be managed to meet (VRM) Class II objectives, which would include moving toward a natural wetland community environment.

## **Monitoring Question**

- \* Are management actions in VRM Class II areas meeting or exceeding visual resource management class objectives?

## **Standards**

- \* Upon completion of a major surface-disturbing project, the visual resource will be evaluated to determine if the VRM Class II objectives were met.

## **Costs**

An estimated \$1,000 annually.

:

# **Livestock Grazing Management**

## **Expected Future Conditions and Outputs**

Livestock grazing may be used as a tool for manipulating vegetation or achieving some other resource goal. If grazing is used, grazing prescriptions would be developed to identify the goals and objectives for vegetation removal. This will be completed through a team of interdisciplinary resource specialists, as well as the Wood River Wetland Team, to meet identified objectives in the Preferred Alternative.

## **Monitoring Questions**

- \* Are goals and objectives for vegetation, riparian, and water quality being met?

## **Standards**

- \* Use approved BLM monitoring techniques to analyze present management systems. Monitoring is a tool to see if resource goals and objectives are being met. Specific monitoring techniques would follow the 1988 Oregon Rangeland Monitoring Handbook and the BLM Grazing Technical Reference Series.

## **Costs**

An estimated \$500 per grazing period for each project.



# Appendix 4

## Wood River Potential Area of Critical Environmental Concern Evaluation

### Introduction

An Area of Critical Environmental Concern (ACEC) designation highlights an area where special management attention is needed by the Bureau of Land Management (BLM) to protect and prevent irreparable damage to important historic, cultural, and scenic values; fish or wildlife resources; other natural systems or processes; or to protect human life and safety from natural hazards. The ACEC designation indicates to the public that the BLM not only recognizes the area possesses significant values, but has also established special management measures to protect those values. Designation serves as a reminder that the significant values or resources must be accommodated during the BLM's consideration of subsequent management actions and land use proposals near or within an ACEC.

To be considered as a potential ACEC and analyzed as such in resource management plan (RMP) alternatives, inventory data must be analyzed to determine whether there are areas containing significant resources, values, systems or processes, or hazards. To be designated an ACEC, an area must meet both the relevance and importance criteria established and defined in 43 CFR 1610.7-2. They are defined as follows:

**Relevance.** There shall be present a significant historic, cultural, or scenic value; fish or wildlife resource; other natural system or process; or natural hazard.

**Importance.** The above described value, resource, system, process, or hazard shall have substantial significance and values. This generally requires qualities of more than local significance and special worth, consequence, meaning, distinctiveness, or cause for concern. A natural hazard can be important if it is a significant threat to human life or property.

As a result of a BLM interdisciplinary team evaluation, Native American traditional use (cultural value), special status plant species (natural process or system), and vegetation (natural process or system) were included as reasons for further consideration of the Wood River property as a potential ACEC.

This appendix evaluates relevance criteria first, then importance criteria, followed by a summary and conclusion.

### Relevance

As described in BLM Manual 1613, an area meets the "relevance" criterion if it contains one or more of the following:

- \* A significant historic, cultural, or scenic value (including but not limited to rare or sensitive archaeological resources and religious or cultural resources important to Native Americans).

#### **Appendix 4 - Wood River Potential ACEC Evaluation**

- \* A fish and wildlife resource (including but not limited to habitat for endangered, sensitive or threatened species, or habitat essential for maintaining species diversity).
- \* A natural process or system (including but not limited to endangered, sensitive, or threatened plant species; rare, endemic, or relic plants or plant communities which are terrestrial, aquatic, or riparian; or rare geologic features).
- \* Natural hazards (including but not limited to areas of avalanche, dangerous flooding, landslides, unstable soils, seismic activity, or dangerous cliffs). A hazard caused by human action may meet the relevance criteria if it is determined through the resource management plan in process that it has become part of a natural process.

### **Cultural Values**

Cultural resources (see Glossary) include prehistoric and historic resources, and Native American traditional use areas. Prehistoric resources are the remains of Native American occupation before contact with non-native people (approximately 1830 for the Klamath Basin). Historic resources are the remains of occupation of both native and non-native people after contact. Traditional use areas are geographic locations with cultural or religious importance to contemporary Native American groups.

Klamath people, notably the Kowa'cd'lkni (also spelled Kowa'cdi) are suspected to have inhabited the area around the mouth of the Wood River into historic times. The Klamath Tribe's oral history indicates tribal use of the area. If so, their cultural remains would likely be contained in and upon the earth surface within the Wood River property. The Wood River property is also known to contain peat bogs, and often, peat bogs adjacent to human occupation areas contain cultural remains.

To establish the presence of the Klamath people in the Wood River Ranch area, within the parameters of the archaeological and historical record, there are three basic references available: Dicken and Dicken (1985), Follansbee et al. (1978), and Mack (1991). These references confirm Native American use in the Klamath Basin and in the area of the Wood River property. The Klamath Tribe's Cultural Resources Coordinator has also furnished information regarding prehistoric and Native American traditional use values in the Wood River area.

**Prehistoric Values.** It is known among tribal members that there were village sites and scattered clusters of houses all along Wood River. There are permanent houses of families that used the Wood River Valley, surrounding mountains, and Agency Lake in their seasonal round. Thus it served the central area for many economic, spiritual, and social activities. Some such areas would be discernable through archaeological methods, others would not.

**Native American Traditional Use Values.** The specific area of the Wood River property is the most important wucus gathering area on the east side of Agency Lake. It is also a hunting area for many species of waterfowl, a fishing area, a place where duck and geese eggs are gathered, and an area for collecting the roots and plant fibers of such plants as tules and cattails.

**Conclusion.** The significance of the cultural values, both prehistoric resources and Native American traditional use, meet the criterion for relevance.

### **Fish Resources**

Year-round use by the Lost River sucker, listed as endangered in accordance with the Endangered Species Act, has been documented by the Oregon Department of Fish and Wildlife (ODFW) and the Klamath Tribe. The shortnose sucker, also federally listed as endangered, may also use the area. Candidate fish species for listing under the Endangered Species Act that are documented or suspected in the Wood River area include the Klamath largescale sucker and the redband trout.

The Wood River is managed by the ODFW as a wild trout stream and contains resident, self-sustaining native populations of brown trout. This is the river's main fishery resource during the summer. In the fall, native migratory rainbow trout move from Upper Klamath Lake to the Wood River to spawn. The young trout remain in the river for one to two years before moving out into Upper Klamath Lake.

**Conclusion.** The documented or suspected presence of native trout, two endangered sucker species, and two federal candidate and state sensitive fish species satisfies the relevance criterion for fish.

## Wildlife Resources

The bald eagle, federally listed as threatened in Oregon, uses the Wood River area for both foraging and/or nesting year-round. The peregrine falcon, federally listed as endangered, may also use the area, at least seasonally. Wildlife species that are candidates for listing in accordance with the Endangered Species Act that are documented or suspected in the Wood River area include the white-faced ibis, tri-colored blackbird, black tern, loggerhead shrike, least bittern, long-billed curlew, and western pond turtle. The Wood River property is extremely important for the spotted frog, also a federal candidate species, as this is the only remaining site in Klamath County where there has been a confirmed sighting in the last five years.

The Wood River property provides habitat for a variety of wildlife species. Four main habitat-types include permanent wetlands with aquatic or emergent vegetation, pastures (or meadows) of short grass communities, woody and riparian vegetation areas, and open water areas on the lake and near the shoreline. These habitats are used for foraging (feeding), roosting (resting), nesting, breeding, brooding, rearing, staging (gathering) during migrations, denning (sheltering), and basking (sunning). Waterfowl (ducks and geese), wading birds (herons and egrets), shorebirds (sandpipers and ibis), neotropical migratory birds (tri-colored blackbirds, meadowlarks, etc.), raptors (owls, red-tailed hawks, osprey), small mammals (ground squirrels), and furbearers (otter and beaver) all use these habitats to various extents and for various purposes.

**Conclusion.** The documented or suspected presence of several federal and state threatened, endangered, sensitive, and candidate wildlife species, as well as a wide diversity of other wildlife species, that live in or migrate through the Wood River property area satisfies the criterion for relevance.

## Natural Processes and Systems

The long-term management goal for the property would be to restore the majority of the property to a functioning wetland community. The primary objectives would be to improve water quality and quantity entering Agency and Upper Klamath lakes; and to restore and enhance wetland habitat, primarily for Lost River and shorthose suckers, waterfowl, and secondarily for other species.

Over the last two decades wetlands have become widely recognized as an important component of the ecosystem for their role in improving water quality, reducing flooding, providing important fish and wildlife habitat, groundwater recharge, and many other important functions. Yet, annual net wetland losses in the U.S. during the 1980s totaled more than 2.6 million acres (Frayer 1991). Wetland restoration techniques are being explored in an attempt to reverse this trend.

Restoration of wetlands on the property will demonstrate the relationship between various environmental conditions (such as water depth and water flow) and the native wetland vegetation that will occupy those sites. Further, the site will demonstrate the relationship between the habitats that various vegetation communities provide and the wildlife species that use those habitats.

**Conclusion.** The long-term management goals for the Wood River property and potential for restoration, combined with the importance of wetlands satisfies the relevance criterion for the occurrence of a natural process or system.

# Importance

Those values, resources, systems, processes, or hazards described under the Relevance section must have substantial significance and value to satisfy the importance criterion. This generally means that the value, resource, system, process, or hazard is characterized by one or more of the following:

- \* Has more than locally significant qualities which give it special worth, consequence, meaning, distinctiveness, or cause for concern, especially compared to any similar resource.
- \* Has qualities or circumstances that make it fragile, sensitive, rare, irreplaceable, exemplary, unique, endangered, threatened, or vulnerable to adverse change.
- \* Has been recognized as warranting protection to satisfy national priority concerns or to carry out the mandates of the Federal Land Policy and Management Act.
- \* Has qualities that warrant highlighting to satisfy public or management concerns about safety and public welfare.
- \* Poses a significant threat to human life and safety or to property.

## Cultural Values

A number of sources have confirmed the prehistoric values and Native American uses in the Klamath Basin and in the area of the Wood River property.

**Prehistoric Values.** It is known among tribal members that there were village sites and scattered clusters of houses all along the Wood River. There were permanent houses of families that used the Wood River Valley, surrounding mountains, and Agency Lake in their seasonal round. Thus it served the central area for many economic, spiritual, and social activities.

**Native American Traditional Use Values.** The specific area of the Wood River property is the most important wucus gathering area on the east side of Agency Lake. It is also a hunting area for many species of waterfowl, a fishing area, a place where duck and geese eggs are gathered, and an area for collecting the roots and plant fibers of such plants as tules and cattails.

**Conclusion.** The cultural values within the proposed ACEC are fragile, sensitive, irreplaceable, and have more than local significance. The traditional use of the area by Native Americans has more than local significance, which gives it special worth, meaning, and distinctiveness. The prehistoric values and Native American traditional use within the proposed ACEC both meet the criterion for importance.

## Fish Resources

The Lost River and shortnose suckers, two federal and state endangered species, are documented or suspected to occur within the proposed ACEC. The Klamath largescale sucker and redband trout, federal candidate (category 2) and Oregon state sensitive species, are also likely occur within the area.

The Wood River is managed by the ODFW as a wild trout stream and contains resident, self-sustaining populations of brown trout. This is the river's main fishery resource during the summer which draws anglers from outside the region who come to fish for more than one day.

**Conclusion.** The wild trout population of the Wood River is unique, fragile, sensitive, and vulnerable to adverse environmental change. Fish resources (including both the wild trout and endangered suckers) in the proposed ACEC, which are more than locally significant and have been recognized as warranting protection, meet the criterion for importance.

## Wildlife Resources

There are two federally listed threatened or endangered species and eight federal candidate species known or suspected to occur in the proposed ACEC, including the only documented occurrence of the spotted frog in the Klamath Basin in the last five years.

Wildlife habitat within the proposed ACEC is of exceptionally high quality and diversity, as evidenced by the numbers and diversity of wildlife species living in and migrating through the area. This diversity is associated with the wetland and riparian habitats, the location of the Wood River property on the western flyway for migratory birds, and its position at the north end of Agency and Upper Klamath lakes. Birds migrating north stop to rest after the long flight over water, and birds migrating south "stack up" before flying across the lake.

**Conclusion.** The quality and diversity of wildlife habitats and populations in the proposed ACEC are unique and have more than local significance. Several of the species are threatened, endangered, or sensitive, and are vulnerable to adverse impacts. They satisfy the importance criterion.

## Natural Processes and Systems

The Wood River property is in the Klamath River Basin, which includes portions of southern Oregon and northern California, as well as an anadromous fishery in the adjacent Pacific Ocean. Management of the property as an ACEC to restore a functioning, natural wetland and to determine the effects of those functions and processes on water quality and quantity would have implications for the whole upper Klamath Basin which in turn affects the entire Klamath River Basin. The property was recognized in the Congressional appropriations legislation for acquisition because of its location, importance to the Klamath River Basin, and its wetland restoration potential.

**Conclusion.** Wetland functions and processes, and their effects on water quality and quantity are of more than local significance. The importance criterion for a natural process or system is met.

## Summary

For an area to be designated an ACEC it is only necessary for one value to meet both the relevance and importance criteria. Four values on the Wood River property have been found to meet the relevance criterion. Cultural values (both prehistoric values and Native American traditional use), fish and wildlife (both populations and habitat) resources, and a natural process or system. All four of those values were also found to meet the importance criterion.

## Conclusion

The Wood River property meets both the relevance and importance criteria. It is identified as a potential area of critical environmental concern and is recommended for designation as such.



# Appendix 5

# Wild and Scenic River

# Eligibility Determinations

## Summary

Neither the Wood River nor Sevenmile Creek were found to be eligible for inclusion in the National Wild and Scenic Rivers System. They have been dropped from further consideration, which means that neither a classification determination nor a suitability assessment were conducted.

## Purpose and Need

Section 5(d) of the National Wild and Scenic Rivers Act (NWSRA) (and BLM Manual 8351) states that "in all planning for the use and development of water and related land resources, consideration shall be given by all federal agencies to potential national wild, scenic, and recreational river areas". Therefore, the portions of Wood River and Sevenmile Creek that flow through or are adjacent to the recently acquired Wood River property were considered by the Klamath Falls Resource Area BLM's interdisciplinary team.

## Steps to Evaluate a Potential River Segment

The steps in considering potential national wild, scenic, and recreational river areas include (1) determining if the river or river segment is eligible, (2) determining the highest possible classification of those rivers that have been found to be eligible, and (3) assessing the suitability of those rivers that have been found to be eligible.

## Eligibility Criteria

To be *eligible* for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must possess one or more outstandingly remarkable values (ORVs). *Free-flowing*, as defined in section 16(b) of the NWSRA, means "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." Outstandingly remarkable values include scenic, recreational, geologic, fish, wildlife, historic, cultural, or other similar values.

**Eligibility Determination.** The channels of the Wood River and Sevenmile Creek that flow through or are adjacent to the recently acquired Wood River property are both highly modified by straightening, dredging, and by adjoining canal embankments. The section of Sevenmile Creek that runs along the BLM-administered land has been renamed Sevenmile Canal, indicating its level of modification. Upstream from the BLM river segments (both Wood River and Sevenmile Creek) several irrigation diversions are found, greatly regulating the streamflow into Agency Lake. Although Alternative D, the Preferred Alternative in this draft Resource Management Plan, proposes to

#### *Appendix 5 - Wild and Scenic River Eligibility Determinations*

restore Wood River (first priority) and Sevenmile Creek (second priority) to their historic meandering channels, neither river fits the definition of free-flowing as they currently exist, and therefore, neither river was found to be eligible.

## Further Consideration

Because both the Wood River and Sevenmile Creek were found not eligible, neither a classification determination nor a suitability assessment was done.

During the next planning cycle, if the stream restoration has been successfully completed, then the river segments could be studied again for potential eligibility. Until that time, no special management actions will be in effect along these river segments.

## Further Information

Further information on the eligibility process and BLM interdisciplinary team results can be found in the Klamath Falls Resource Area office during regular business hours.

# Appendix 6

## Water Resources, Wetland Functions

### Introduction

When analyzing the environmental effects of Alternatives B, C, and D, it is important to understand the effects of different wetland types on water quantity and water quality. Then, depending on the type and extent of the wetland(s) that would be created by each alternative, a comparison can be made for impacts expected under the No Action Alternative (continuation of current management). This appendix will discuss some fundamental concepts to provide a basic understanding of the effects of various wetland types on water quality and quantity.

In general terms, wetlands are lands where water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in or above the soil surface. The one feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water. Wetlands are lands that are transitional between terrestrial and aquatic systems (USFWS 1992b).

Wetlands are dynamic ecosystems. Because wetlands are an intermediate stage between truly terrestrial and truly aquatic systems, a change in water level will result in a shift of the wetland towards one or the other of these states. However, although there are documented cases of long-term stability or even a shift to a more aquatic state, the general direction of wetland succession is toward a reduction in water level and a change to the drier state (Howard-Williams 1985).

Natural changes in water level in a wetland can be brought about by autogenic or allogenic processes. Autogenic processes are those caused by the growth of the wetland plants themselves, and the allogenic processes are caused by external factors. For example, litter deposition raising the bed of the wetland would be autogenic, and siltation or precipitation of incoming suspended material in throughflow waters would be allogenic. Normally however, wetland succession involves a complex interplay of both autogenic and allogenic processes. The latter clearly modify the former and in many cases external factors such as fires, drawdowns, or floods can maintain a wetland at an apparently stable state for long periods of time (Howard-Williams 1985).

The U.S. Fish and Wildlife Service has developed and adopted a wetland and deepwater habitat classification system. This system, outlined in the publication *Classification of Wetlands and Deepwater Habitats of the United States* (USFWS 1992b), describes ecological taxa (see Glossary), arranges them into a system useful to resource managers, and provides uniformity of concepts and terms. Other agencies, including the Bureau of Land Management, use this system for classification of wetlands.

### Wetland Hydrology

The hydrology of wetland systems influences plant species and their succession, soil development and chemistry, and water quality.

"By definition, all wetlands are created and maintained by water. The frequency, depth, and duration of the water's influence determine, to a significant extent, the vegetation present and the functions that the wetland

provides. Water, whether from a surface water source or from groundwater, is the most critical feature to define and evaluate in attempting to reproduce a naturally occurring wetland system.

In order to create a wetland system which provides specific functions, one specific hydroperiod or range of hydroperiods is often most effective or desirable. A hydroperiod is defined as the periodic or regular occurrence of flooding and/or saturated soil conditions" (Marble 1992).

Numerous hydrologic processes may be interacting at any given time in a wetland area. A water budget (a mathematical description of the hydrologic processes of a wetland) assessing the inflow, outflow, and storage of a wetland for a specific time period can be critical to understanding and quantifying the hydrologic processes influencing a particular wetland. The magnitude and duration of seasonal water level changes are important because they directly influence the chemical and biological processes in a wetland. These changes can also be diverse and relatively complex (Strickland 1986). Once a water budget is developed for a wetland, it can be used to determine which functional processes will dominate a particular wetland and the effects of those processes on water quality and quantity.

## **Surface Flow**

Most water movement in wetlands is by surface flow, because subsurface flow rates are restricted by saturated soil conditions. Surface water often enters a wetland system in the form of channelized or overland flow. Once the water enters the wetland, this surface flow becomes sheet flow. Sheet flow occurs because wetlands lack channels, and force the water to take a tortuous route through the surface vegetation (Stednick 1988).

Wetlands have the ability to alter floodwaters and attenuate flood peaks. Flood alteration is the process by which peak flows from runoff, surface flow, and precipitation are stored or delayed. Wetlands, as well as upland areas, act to detain flood waters by intercepting sheet flow and flood waters. By lowering flood peaks, wetlands act to decrease flood-related damage. The importance of a wetland in altering floodflows depends to a great extent on its position in the watershed and its outlet characteristics. The magnitude of attenuation is a function of the wetland's floodwater storage capacity and outlet discharge capacity relative to the magnitude and volume of the inflow flood (Strickland 1986).

Another function attributed to wetlands is the "desynchronization" of flood peaks. Desynchronization occurs when, at some point of interest downstream of the wetland, the flood peak discharge from the wetland does not coincide with the peak discharge from other tributary drainage areas of the watershed. In other words, the flood peak discharge from the wetland is delayed in comparison to what would have occurred had the wetland not been present (Strickland 1986).

## **Characteristics of Wetlands that Maximize Flood Alteration Benefits**

In general, riparian and freshwater impounded wetlands are more efficient at attenuating "typical" flood events (that is, the two- to five-year flood event). They become less efficient as the magnitude of the inflow flood increases (Strickland 1986). Wetlands with more vegetation than open water are more capable of altering floodflows. The vegetation slows floodwaters by creating frictional drag in proportion to stem density. Channel roughness (see Glossary) and thus the ability to retain floodwater increases with increasing vegetation density. Because the effect of vegetational resistance rapidly diminishes as the water depth becomes greater than the height of the vegetation, sheet flow, rather than channel flow, is altered the most. Wetlands with a low gradient and a basin morphology that allows water to spread out rather than remain in a channel, such as the Wood River property, will lend itself to sheet flow conditions (Marble 1992).

## **Groundwater**

Wetlands can raise the groundwater table immediately adjacent to them, and can stabilize groundwater flow by reducing seasonal fluctuations (Hensel and Miller 1991). Wetlands recharge groundwater by holding surface water long enough to allow the water to percolate into the underlying sediments and/or bedrock aquifers. Once the water

reaches the groundwater system, it aids in augmenting low flow of surface water streams and lakes. The magnitude of the recharge effect is dependent upon the location of the underlying groundwater table and the porosity of the soil and bedrock that allows drainage to the underlying groundwater system. Wetland systems buffer against extreme seasonal fluctuations in groundwater levels. The mass of soil and vegetation associated with wetlands acts as a sponge, soaking up water during wet cycles and releasing it during drier times. The extent of such buffering is a function of the hydraulic properties of the soil and groundwater flows.

## **Characteristics of Wetlands that Maximize Groundwater Benefits**

Wetlands underlain by permeable soils with high infiltration rates are more likely to recharge groundwater. Organic soils and clays may not transmit water rapidly enough to be effective in recharging groundwater or may create a barrier, preventing surface water from percolating to groundwater. Features that allow water to rapidly flow out of a wetland, including channels, levees, ditches, canals, or similar types of drainage features also reduce the opportunity for water to percolate into the underlying substrate. Soils that are seasonally or temporarily flooded are more likely to transmit water than saturated soil. This occurs when fluctuating water levels in a wetland periodically inundate adjacent unsaturated soils (Marble 1992).

# **Function of Wetlands in Relation to Water Quality**

Surface water quality characteristics most influenced by wetland systems are suspended sediment, macronutrients (nitrogen and phosphorus), and heavy metals (including micronutrients).

## **Sediment**

Water moving through a wetland carries suspended soil particles and particulate organic matter, collectively called sediment. Sediment trapping is defined as the process by which particulate matter is deposited and retained within a wetland. There are some general properties that may be applied to all wetlands with respect to their ability to trap sediments. The velocity of the water must be fast enough to transport sediment to the wetland and then slow enough through the wetland to allow the sediment to settle out of the water. The residence time of the water is the length of time it remains in the wetland. As the residence time increases so does the proportion of the sediment load that will be deposited in the wetland. Generally, long residence times are necessary to allow the clay fraction of the sediment load to settle out of the water column. Available sediment refers to the amount of sediment that is transported to the wetland. If more sediment is brought to the wetland than can be transported away, then the sediment will accumulate there. On the other hand, if there is only a small source of sediment there will be little accumulation (Strickland 1986).

As the age of a wetland increases, the sediment accretion rate decreases. Wetland systems that have been subject to sediment-laden waters for several years, or have large sediment deposits, may eventually become less effective in trapping sediments. This loss of efficiency can be caused by changes in vegetation which results in less energy dissipation. Or, when runoff waters become channelized by deposited sediments, the energy of the water increases which allows more sediment to be retained in the water column (Stednick 1988). The base level of a wetland is the level above which there can be no deposition. For riverine-associated wetlands the base level is the height of water during flooding. As the level of the sediment-water interface approaches base level, the wetland will experience decreased vertical growth and start to accumulate horizontally, if conditions permit (Strickland 1986).

## **Characteristics of Wetlands that Maximize Sediment Deposition**

Because sediment retention times are generally shortest in riverine wetlands and flooding events frequently erode bottom sediments, lacustrine (lake) or palustrine (swamp) wetland systems are more effective at retaining sediment.

Riverine systems may carry large quantities of suspended sediments and associated toxicants. A wetland in a wind-sheltered area where the adjacent topographic relief is sufficient or adequate vegetation breaks exist to protect the site will be less prone to wind mixing, which encourages the suspension and transport of sediments out of the wetland. Wetlands with shallow water (less than 40 inches depth) favor vegetation growth. Extensive stands of vegetation offer frictional resistance to water flow and enhance sedimentation. Wetland vegetation also reduces the resuspension of bottom sediments from wind mixing and lengthens the flow pattern of water through the wetland. Wetland vegetation also contributes to the organic content of the bottom sediments which, in turn, helps retain toxicants associated with sediments. Persistent wetland vegetation species are desirable because they remain standing through the winter season and function to remove sediment throughout the year (Marble 1992).

There are three aspects of wetland plants that influence the amount of organic material they produce and deposit as detritus: productivity, nitrogen-fixing ability, and the capacity for physical dispersal. Aquatic bed species generally are the most productive, since they can transfer nutrients from the sediment to the water column and they decompose more rapidly than other vegetation forms. Emergent vegetation is also highly productive, more so than woody vegetation (Marble 1992). Plant detritus is decomposed and transported at different species-specific rates. A variety of vegetation classes will therefore make production/export rates more balanced throughout the year.

## **Nutrients**

Marble (1992) states the following on nutrients:

"Wetlands can improve water quality by removing nutrients. Nutrients can be removed from both the water column and sediments during the growing season. On a short-term basis, nutrients can be taken up and stored by wetland vegetation. Once the plants die or defoliate, the nutrients are returned to the water and sediment. Nutrients may be removed by physically burying the sediments (organic and inorganic) to which they are attached. Sediments carry nutrients through absorption and adsorption. Sediment particles are removed by dense wetland vegetation which slows the flow of sediment-laden water. The slower the water velocity, the greater the settling of sediments from the water column and thus the increase of nutrient burial."

Several chemical and microbial processes also function to remove or transform nutrients. De-nitrification results in the permanent loss of nitrogen from a wetland. De-nitrification is the conversion of dissolved nitrogen to gaseous nitrogen by microbes in anaerobic conditions. Nitrogen fixation involves the conversion or fixation of gaseous nitrogen into inorganic forms by bacterial and blue-green algae. Ammonium volatilization is an abiotic process which results in the removal of ammonium by evaporation. The process occurs at high temperatures and at a pH of greater than 7.5. A relatively minor mechanism for nitrogen removal is biotic in nature. Seasonal emergence of aquatic insects and consumption of nutrient rich aquatic plants by waterfowl or livestock may result in seasonal and sometimes permanent losses of nitrogen from wetlands. Phosphorus is immobilized in wetland sediments through adsorption and precipitation."

When a wetland becomes the recipient of waters with higher nutrient content than those it normally experiences, there is response in the vegetation. Increases in nitrogen and phosphorus delivery to a wetland can cause biomass expansion and changes in plant species composition and/or relative abundance. The increased availability of nutrients produces more vegetation during the growing season, which in turn means more litter during the non-growing season. This litter requires several years to decay, and hence the total pool of living and dead material grows slowly over several years to a new and higher value. A portion of this litter becomes new organic soil. Such organic sediments can be good sorbents for a number of dissolved constituents. The accretion of soils and sediments thus contributes to the effectiveness of a wetland for water quality improvement (Kedlec and Alvord 1989).

Litterfall, when coincident with high or peak flows, may result in a net release of plant essential nutrients from a wetland. Litterfall alone may result in plant essential nutrient releases if outputs are greater than inputs and litterfall mass overrides decomposition rates (Stednick 1988). In low-lying areas of a wetland, water may be stagnant except during peak runoff periods. This water may have nitrogen, phosphorus, and other constituents leach into it from decaying plants or other debris. Overflow from and through these areas during runoff events may then contribute large quantities of dissolved and suspended material to downstream waters.

Both the hydrology and the uptake of nutrients by wetland vegetation can vary seasonally. Seasonal variability of nutrient cycling in freshwater wetlands can be attributed to timing and duration of water renewal; sediment and water nutrient concentrations; anaerobic conditions; duration of ice cover; death of vegetation; and the length of the growing season (Strickland 1986). Seasonality affects the ability of a wetland to act as a nutrient sink. With the onset of the growing season and increased plant uptake, dissolved nutrient concentrations decline. As summer progresses the water levels fall which allows greater aeration of the sediments. Aeration decreases the solubility of phosphorous and decreases de-nitrification, both of which serve to immobilize nutrients. At the end of the growing season massive plant death releases accumulated nutrients. Declines in pH at this time also promote nutrient release and low temperatures suppress de-nitrification (Strickland 1986).

Evaporative effects can markedly alter wetland hydrological regimes and thus nutrient budgets. Water losses by evaporation can vary widely from a low of 60 percent to well over 100 percent of those from an equivalent open water surface. Evaporative processes can change the nutrient status of wetlands by a process of concentrating nutrients through water loss (Howard-Williams 1985).

## **Characteristics of Wetlands that Maximize Nutrient Treatment**

Water velocity decreases with decreasing slope. As water velocity decreases, the potential for nutrient removal increases. This effect is maximized when water depth in a wetland does not exceed 50 percent of plant height. Wetlands with no outlets or constricted outlets (and therefore greater water retention times) have an increased probability of sedimentation, adsorption, biological processing, and retention of nutrients. The presence of vegetation offers frictional resistance to water, acts to bind sediment, and favors nutrient burial. Nutrient uptake is generally highest by emergent plants, particularly persistent species. However, because different vegetation forms are involved in removing nutrients in different ways, a diversity of vegetation classes ensures that most nutrient cycling processes will be present. For phosphorous removal, a wetland needs to have primarily alluvial, ferric, clay, or other underlying fine soils because these sediments contain high levels of aluminum, calcium, or iron that favor the removal of phosphorus. Nitrogen is best removed by permanently flooded or saturated conditions or by irregularly fluctuating water conditions in floodplain areas. For maximum nitrogen removal, the presence of use highly organic soils is needed (Marble 1992).

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# Appendix 7

## Stream Channel and Wetland Restoration Options

### Introduction

This appendix describes a number of options for doing both stream channel restoration and wetland restoration. Each of these options is used in one or more of the management alternatives described in Chapter 3 to accomplish the alternative's management objectives. It is the combination of options to be used that makes each alternative unique. Since Alternative A would not restore the property to a wetland condition, none of these options apply to that alternative.

These options were originally developed by the U.S. Bureau of Reclamation's (USBR) Denver office, before detailed topography was available, and were modified by the BLM to fit the management alternatives. The USBR's original options were separated by geographic region, including the Wood River property's north half, south half, and Marsh (Outside [east of] main property's interior) (see Map 2 in Chapter 3). For simplicity, they were combined in this appendix. Most of the options could be initiated for the north half only, the south half only, or the entire parcel. For more information, please contact Eric Stiles at the USBR's Denver office during regular business hours.

Each option listed below includes a description of the option, the structural requirements (such as new berms or water control needs), additional information needs, schedules of completion, and the apparent benefits and problems of that option. Each option description also includes the alternatives in Chapter 3 that could implement the option to accomplish the wetland or stream restoration objectives of the alternative. See Table 5 in Chapter 3 and Table 6 in Chapter 4 for a graphic comparison of the options used in each alternative.

### Stream Channel Restoration

#### Option 1: Restore the Wood River by establishing a meandering flow pattern in the Wood River Marsh (outside the dike from the main property's interior).

**Description.** Current conditions within the Wood River Marsh are modified to provide fish habitat elements by establishing a meandering flow pattern within the existing marsh. This includes dredging of channels within the existing marsh and maintaining existing levees. Provide dredged channel by copying the meandering pattern of the Wood River shown on historic aerial photography.

**Structural Requirements.** Dredging of channel to create meanders, placement of fill material in portions of existing (straight) dredged channel.

**Information Needs.** Wood River channel hydraulics and hydrology, sediment load estimate, and historic channel pattern data for Wood River property.

**Scheduling.** Could be done at the same time with any other option. Permanent.

## *Appendix 7 - Stream and Wetland Restoration Options*

**Apparent Pros.** Improved fish habitat conditions within the Wood River Marsh.

**Apparent Cons.** Could have expensive data collection and design components. Acquiring permits for wetland dredging could be lengthy and could require mitigation.

**Applies to:** Alternatives B, C, and D.

### **Option 2: Restore wetland by establishing a meandering flow pattern for Sevenmile Creek through the main property's interior.**

**Description.** Restore wetland on the south half by creating shallow channels extending from the Sevenmile Creek at the northwest corner of the south half, and outflow to the lake through the southern perimeter berm. Restore wetland on the north half supported by inflows from the Sevenmile Creek and outflow to the lake through the south half. New channels are designed to be consistent with the historic meander patterns and flow routing through the property. Strategy completely inundates the south half, which is isolated by containment berms. Water passes through the restored wetland area on the property. High water levels are likely to submerge the entire area such that inflow is not confined to channels, whereas low water may tend to follow channels through the area. Modify containment berm between north and south halves to allow flow through. Restore wetland to intercept Sevenmile Creek water while maximizing the fish passage and extent of habitat accessible to fish species. Construction of control structures and fill placement will require federal and state permits.

**Structural Requirements.** Water controls upstream at the Sevenmile Creek connection and the downstream perimeter berm to release water from the south/north half to the lake. Modify containment berm between north and south halves to allow flow through. Filling existing drainage system on the property. Excavate new meandering channels through the main property's interior.

**Information Needs.** Containment by berms along property's midway canal. Topography of main property interior. Seed bank potential and operating criteria to establish wetland vegetation. Ability to divert flow from Sevenmile Creek. Effects of water level fluctuations in Agency Lake on the operation of water directed through the restored wetland area. Design criteria for channels.

**Scheduling.** Could be initiated any time after design issues are resolved, with the south half completed before the north half. Initiate as permanent phase after wetland ecosystem is established. This option is considered permanent, and moderately difficult to reverse.

**Apparent Pros.** Relatively low maintenance requirements anticipated to sustain restored wetland in the long term. Moderate cost as existing drainages are filled. Offers greatest potential for fish habitat values and passage to riverine systems. Enhancement potential for waterfowl and other wetland species. Material to fill drainage system can be produced from stream channel excavation work. Sediment transport and stagnation problems are reduced with channels. Consistent with historic wetland conditions within site constraints.

**Apparent Cons.** Habitat improvement performance attributes are not entirely defined. Water quality improvement characteristics are incidental and performance is unknown.

**Applies to:** Alternatives B and D

### **Option 3: Restore wetland by establishing a meandering flow pattern for Wood River through the main property's interior.**

**Description.** Restore wetland on the south half by creating shallow channels extending from the Wood River at the northeast corner of the south half, and outflow to Agency Lake through the southern perimeter berm. New channels are designed to be consistent with the historic meander patterns and flow routing through the main property's interior. Restore wetland on the north half supported by inflows from Wood River and outflow to the lake through the

south half. New channels are designed to be consistent with the historic meander patterns and flow routing through the property. Strategy completely inundates the south half, which is isolated by containment berms. Water passes through the restored wetland area. High water levels are likely to submerge the entire area such that inflow is not confined to channels, whereas low water may tend to follow channels through the area. Modify containment berm between south and north halves to allow flow through. Restore wetland to intercept Wood River water while maximizing the fish passage and extent of habitat accessible to fish species. Construction of control structures and fill placement will require federal and state permits.

**Structural Requirements.** Water controls upstream at the Wood River connection and the downstream perimeter berm to release water from the south half to the lake. Modification of containment berm between north and south halves. Filling existing drainage system on the property. Excavate new meandering channels through the main property's interior.

**Information Needs.** Containment by berms along property's midway canal. Topographic information, flow information, and sediment estimate. Seed bank potential and operating criteria to establish wetland vegetation. Ability to divert flow from Wood River. Effects of water level fluctuations in Agency Lake on the operation of water directed through the restored wetland area. Water flow effects on the Wood River Marsh east of the Wood River. Design criteria for channel and diversion.

**Scheduling.** Could be initiated any time after design issues are resolved, with the south half completed before the north half. Initiate as permanent phase after wetland ecosystem is established. This option is considered permanent, and moderately difficult to reverse.

**Apparent Pros.** Relatively low maintenance requirements anticipated to sustain restored wetland in the long term. Offers greatest potential for fish habitat values and passage to riverine systems. Enhancement potential for waterfowl and other wetland species. Material to fill drainage system can be produced from channel excavation work. Sediment transport and stagnation problems are reduced with channels. Some evidence (on aerial photos) of historic wetland flow from the Wood River through the southeast area of the property, although not distinct. Best opportunity appears to be if option is done in conjunction with corresponding Sevenmile Creek option.

**Apparent Cons.** Habitat improvement performance attributes are not entirely defined. Water quality improvement characteristics are incidental and performance is unknown. Existing berm on the east side of the property could make water control between the restored wetland and existing Wood River Marsh more complicated than the Sevenmile Creek configuration (Option 2).

Applies to: Alternatives B and D

## Wetland Restoration

### Option 1: Restore wetland by operating the existing canal and pump system.

**Description.** Restore wetland on the north/south halves of the property by operating the existing canal and pump system to establish, as well as maintain, a wetland ecosystem. Strategy completely inundates the south half, which is isolated by containment berms. Relies on existing mechanisms to introduce water to the area, while the pump system is used to remove or circulate water through the area. Restore wetland and manipulate water levels in a manner that enhances habitat for certain species, and to manage wetland vegetation.

**Structural Requirements.** None, other than to check and rehabilitate existing systems as needed.

## **Appendix 7 - Stream and Wetland Restoration Options**

**Information Needs.** Containment by berms along property midway canal. Seed bank potential and operating criteria to establish wetland vegetation. Operation's susceptibility to seasonal water level fluctuations. Topographic information, seed bank potential, and operating criteria for wetland vegetation establishment.

**Scheduling.** Could be initiated any time as a permanent operating mode. Could be applied as an interim strategy to establish wetland vegetation in preparation for other options. Incorporate in scheduling of staged implementation plans for other options, or initiate as a permanent wetland operating strategy. Fairly easily reversed.

**Apparent Pros.** Low costs associated with system rehabilitation for long-term use. Does not appear to alter existing land and water use practices nearby. Habitat values enhanced for waterfowl and other wetland-dependant species. Allows water management to enhance habitat.

**Apparent Cons.** Has no potential to improve fish habitat conditions unless conveyance structures are added to allow passage into the restored wetland area. Even then, there is no connectivity to the riverine systems since water is pumped out of the area. Ability to improve water quality is limited without further modifications to the main property's interior, although stagnant conditions may be reduced by operating the pumping systems to improve circulation or to dry the area temporarily.

Applies to: Alternatives B, C, and D

### **Option 2: Restore wetland by re-establishing the lake-wetland interface (opening the property's interior to prevailing water levels in Agency Lake).**

**Description.** Restore wetland that is supported solely by lake water levels, to reduce or eliminate the need for water control manipulations. Establish wetland on the south half of the property by opening the area to prevailing water levels in Agency Lake. Could consist of pipes installed through the containment dike along the southern perimeter, to allow lake water passage to and from the south half. Strategy completely inundates the south half, which is isolated by containment berms. Restore wetland in north half with backwater from south half. This is accomplished by placement of pipes through the interior containment dike to allow water passage from the south half. Rely only on ambient water levels in the lake to provide water to the wetland, subject to variations according to seasonal fluctuations. Construction of control structures and fill placement will require federal and state permits.

**Structural Requirements.** Culvert pipe system, with or without control gates.

**Information Needs.** Containment by berms along property's midway canal. Topographic information, seed bank potential, and operating criteria to establish wetland vegetation.

**Scheduling.** Could be initiated any time, with the south half completed before the north half. Best construction time at low water levels. Initiate when area can be dedicated permanently for wetlands. This option is considered permanent, although fairly easily reversed.

**Apparent Pros.** Moderate costs associated with culvert pipe systems. Low management needs after initial establishment period. Does not alter nearby land and water use practices.

**Apparent Cons.** Restoration of the south half has relatively little potential to substantially improve fish habitat conditions since there is no connectivity to the riverine systems. Restoration of the north half has moderate potential to substantially improve fish habitat conditions since connection to the riverline systems is dependant upon choice of management option for south half. Flow patterns are not consistent with mechanisms that improve water quality, in fact stagnant water conditions are likely.

Applies to: Alternatives B, C, and D

### **Option 3: Restore wetland supported by inflows from Sevenmile Creek (no pre-defined path) and outflow to Agency Lake.**

**Description.** Restore wetland to intercept Sevenmile Creek water without restoring historic channels or creating new channels to direct flows through the area. Wetland on the south/north halves of the property would be supported by inflows from the Sevenmile Creek at the northwest corner of the south half, and outflow to the lake through the southern perimeter berm. Existing canals in the property area could either be left open, or filled depending on the anticipated interaction with flows. Strategy completely inundates the south half, which is isolated by containment berms. Water passes through the restored wetland area without a pre-defined path, that is, the flow route is subject to the existing site topography.

**Structural Requirements.** Water controls at Sevenmile Creek inflows and at the southern perimeter berm to release water from the south half to the lake.

**Information Needs.** Containment by berms along property's midway canal. Topography, seed bank potential, and operating criteria to establish wetland vegetation. Ability to divert flow from Sevenmile Creek. Effects of water level fluctuations in Agency Lake on the operation of water directed through the restored wetland area.

**Scheduling.** Could be initiated any time after design issues are resolved, with the south half completed before the north half. Initiate as permanent phase after wetland ecosystem is established. This option is considered permanent, although fairly easily reversed.

**Apparent Pros.** Low costs associated with conveyance structures, up to moderate costs if existing canals are filled. Appears to offer some potential for fish habitat and passage to riverine systems, at least during higher flows. Enhancement potential for waterfowl and other wetland species. Fairly easy to implement and operate.

**Apparent Cons.** Does not restore historic meandering channel such that the water distribution through the restored wetland is not defined. As a result, the sediment transport, stagnation problems, and associated habitat values for fish are unknown. Extensive fill material would have to be imported if the internal canals on the property are filled. Water quality improvement characteristics are incidental, and performance is unknown.

**Applies to:** Alternative B

### **Option 4: Restore wetland supported by inflows from Wood River (no pre-defined path) and outflow to Agency Lake.**

**Descriptions.** Restore wetland to intercept Wood River water without restoring historic channels, or creating new channels to direct flows through the area. Wetland on the south half of the property would be supported by inflows from Wood River at the northeast corner of the south half, and outflow to the lake through the southern perimeter berm. Wetland in north half would be supported with inflows from Wood River through the eastern perimeter berm on south half. Existing canals on the property area could either be left open or filled depending on the anticipated interaction with flows. Strategy completely inundates the south half, which is isolated by containment berms. Water passes through the restored wetland area without a pre-defined path, that is, the flow route is subject to the existing site topography. Construction of control structures and fill placement will require federal and state permits.

**Structural Requirements.** Water controls at Wood River inflows and at southern perimeter berm to release water from the south half to the lake.

**Information Needs.** Containment by berms along property's midway canal. Topographic information, flow information, sediment estimate, seed bank potential, and operating criteria to establish wetland vegetation. Ability to divert flow from Wood River. Effects of water level fluctuations in Agency Lake on the operation of water directed through the restored wetland area. Water flow effects on the existing Wood River Marsh, east of the Wood River.

## **Appendix 7 - Stream and Wetland Restoration Options**

**Scheduling.** Could be initiated any time after design issues are resolved, with the south half completed before the north half. Appears to be advantageous to undertake in conjunction with corresponding Sevenmile Creek option. Initiate as permanent phase after wetland ecosystem is established. This option is considered permanent, although fairly easily reversed.

**Apparent Pros.** Low costs associated conveyance structures, up to moderate costs if existing canals are filled. Appears to offer some potential for fish habitat and passage to riverine systems, at least during higher flows. Enhancement potential for waterfowl and other wetland species. Fairly easy to implement and operate.

**Apparent Cons.** Does not restore historic meandering channel such that the water distribution through the restored wetland is not defined. As a result, the sediment transport, stagnation problems, and associated habitat values for fish are unknown. Extensive fill material would have to be imported if the internal canals on the property are filled. Water quality improvement characteristics are incidental and performance is unknown. Existing berm on the east side of the property could make water control between the restored wetland and existing Wood River Marsh more complicated than the Sevenmile Creek configuration.

**Applies to:** Alternative B

### **Option 5: Construct and operate small pilot study areas, primarily to refine design details and operating procedures necessary to proceed with intensive wetland restoration and water quality improvement projects on the Wood River property or on other lands.**

**Description.** Consists of constructing and operating small water quality improvement study plots, primarily to refine design details and operating procedures necessary to proceed with full scale water quality intensive wetland implementation plans. Pilot areas could also be useful for conjunctive studies of habitat attributes and wetland restoration techniques, although these characteristics may be better evaluated in existing Wood River Marsh and restored wetland areas. Begin with the construction of one-acre facilities at the southwest and northeast corners of the south half of the property. These sites offer different water sources and appear to be logically convenient for existing pumping facilities. To address the essential feasibility and design related questions required to proceed with full scale water quality intensive remediation actions adjunct use may be added if consistent with the experimental program and as funds allow. Pilot projects would ultimately cover a majority of the property.

**Structural Requirements.** Unknown until specific projects are defined.

**Information Needs.** Clear objectives regarding water quality improvement goals. Detailed plans to address alternate approaches and key issues. Operating plan with stages leading to ultimate conditions. Compatibility with concurrent activities or ability to integrate with other options.

**Scheduling.** Planning and construction of pilot facilities could begin at any time. Pilot studies are undertaken to define water quality wetland detailed design and operating parameters prior to full system scale implementation. Each pilot project could last for up to ten years or until adequate study results have been collected.

**Apparent Pros.** Allows critical questions to be addressed prior to greater expenditures of time and money on full scale water quality wetland systems. Small pilot areas could be installed and operated for an interim period concurrently with other options.

**Apparent Cons.** Possibly high costs of construction and commitment of resources to accomplish experimental test program. This option is only justified if full-scale water quality wetland remediation approaches and integration with long-term restoration plans are feasible.

**Applies to:** Alternative C

**Option 6: Establish a wetland system/water quality treatment system that is designed to provide the specific flow distribution, retention time, and contact characteristics (vegetation/water contact) that enhance water treatment performance.**

**Description.** Consists of establishing a wetland system that is designed to provide specific flow distribution, retention time, and contact characteristics that enhance water treatment performance. The water quality intensive system could ultimately be either converted to restored wetland that is self sustaining or one that requires long-term manipulation and maintenance. The system would be consistent with management goals and objectives. Construct designed wetland area (south half) and flow routing system (north half) with internal berms and controls to induce the desired hydrodynamic attributes. Develop operating plan and staged conversion to ultimate conditions. Operate wetland treatment system for specified time to improve the quality of water either in the lake system, or to intercept inflow loading at critical times. Construction of control structures and fill placement will require federal and state permits.

**Structural Requirements.** Earthwork, control structures, and pump systems as required.

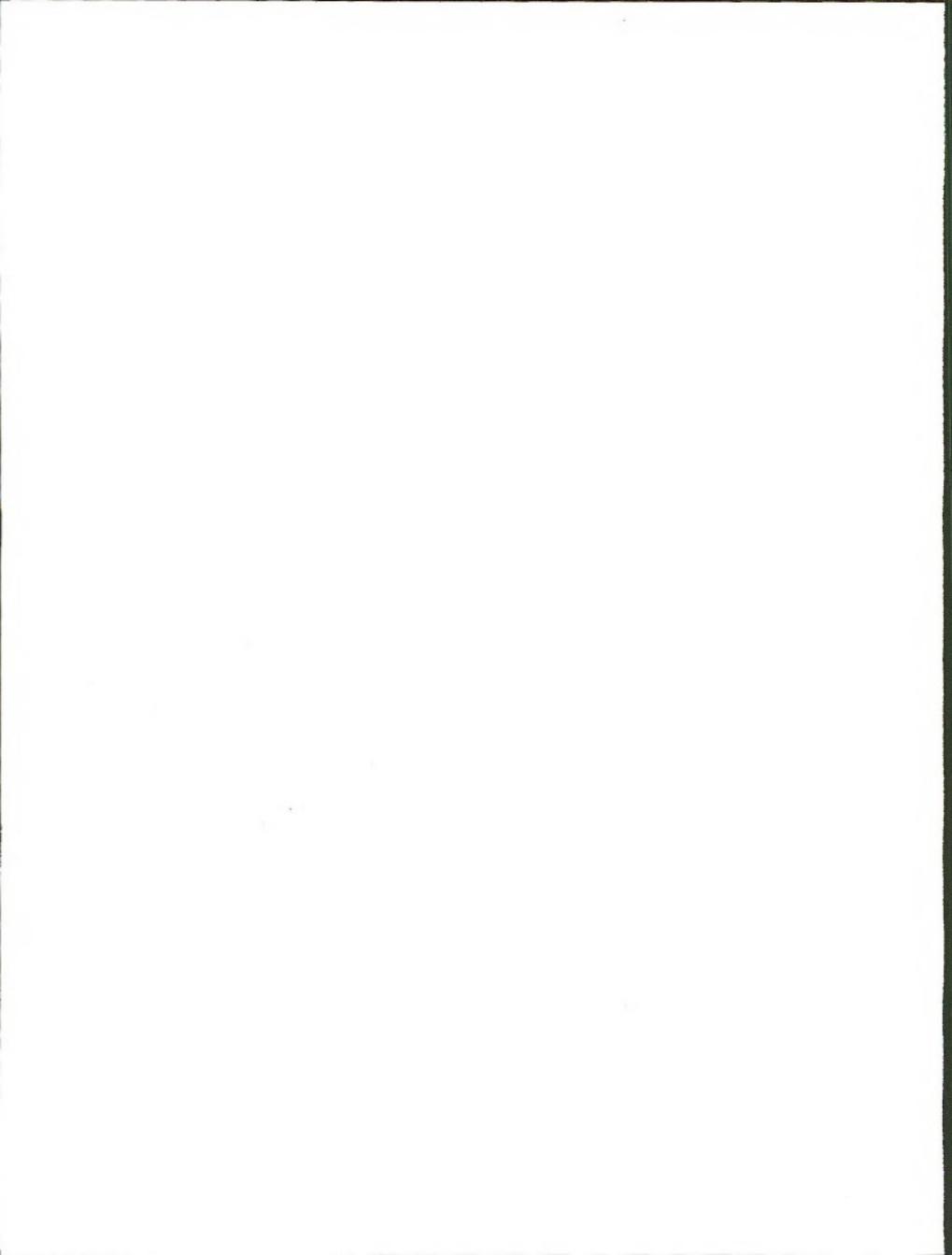
**Information Needs.** Performance attributes in relation to watershed conditions and limitations of alternate approaches. Clear objectives regarding water quality improvement goals. Detailed design criteria and operating plan with stages leading to ultimate conditions. Compatibility with concurrent activities or ability to integrate with other options. Pilot studies appropriate to precede large scale implementation.

**Scheduling.** Staged approach and specific plans are critical to option success. At least three distinct phases; (1) pilot studies, (2) full scale wetland operation, (3) restore areas to ultimate, self-sustaining wetland condition if possible. Exact term of each stage remains to be determined. Permanent, following completion of all stages.

**Apparent Pros.** Enhanced water quality improvement using passive techniques consistent with ecosystem attributes and thereby easily converted to self sustained wetland ecosystem. Greatest level of water quality improvement.

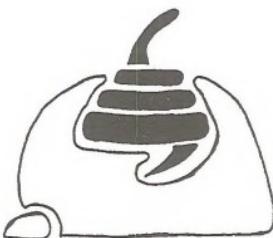
**Apparent Cons.** Relatively high costs can only be justified by significant remediation benefits relative to alternative strategies. Actual watershed remediation is likely to depend on other conjunctive actions to control loading sources and manage water and land resources. Could delay wetland restoration objectives. Requires long term planning and management commitment. Conflicts with more immediate options to restore historic wetland conditions. Site selection is critical since water control requirements and ultimate conversion of this option may be more easily accomplished at alternate sites.

**Applies to:** Alternative C



# Glossary, Bibliography, and Index

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# Glossary

**Absorption** - The taking in or incorporation of molecules of gases, solutes, or liquids into the solid bodies or liquids with which they are in contact.

**Acre Foot** - The volume of water that would cover one acre to a depth of one foot (325,851 gallons).

**Adsorption** - The adhesion in an extremely thin layer of molecules of gases, solutes, or liquids to the surfaces of solid bodies or liquids with which they are in contact.

**Aerobic** - Having molecular oxygen as part of the environment; growing or occurring only in the presence of molecular oxygen.

**Airshed** - The geographic area covered by an air supply.

**Alluvial** - Relating to, composed of, or found in the clay, silt, sand, gravel, or similar detrital material deposited by running water.

**Anaerobic** - The absence of or growing in the absence of molecular oxygen.

**Animal Unit Month** - The amount of forage necessary for maintaining one cow or its equivalent for one month.

**Aquatic Bed** - Wetlands and deepwater habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. Water regimes include subtidal, irregularly exposed, regularly flooded, permanently flooded, intermittently exposed, semipermanently flooded, and seasonally flooded. Aquatic Beds represent a diverse group of plant communities that requires surface water for optimum growth and reproduction. They are best developed in relatively permanent water or under conditions of repeated flooding. The plants are either attached to the substrate or float freely in the water above the bottom or on the surface.

**Area of Critical Environmental Concern (ACEC)** - An area of BLM-administered lands where special management attention is needed to protect and prevent irreparable damage to important historic, cultural or scenic values, fish and wildlife resources or other

natural systems or processes; or to protect life and provide safety from natural hazards. (Also see Potential ACEC.)

**Beneficial Use** - The reasonable use of water for a purpose consistent with the laws and best interest of the peoples of the state. Such uses include, but are not limited to, the following: instream, out of stream and groundwater uses, domestic, municipal, industrial water supply, mining, irrigation, livestock watering, fish and aquatic life, wildlife, fishing, water contact recreation, aesthetics and scenic attraction, hydropower, and commercial navigation.

**Best Management Practices (BMP)** - Methods, measures, or practices designed to prevent or reduce water pollution. Not limited to structural and non-structural controls, and procedures for operations and maintenance. Usually, BMPs are applied as a system of practices rather than one single practice.

**Biomass** - The total mass of organic material of a species per unit of area or volume.

**Biota** - The animal and plant life of a region.

**Breccia** - Fragmental rock whose pieces are angular unlike water worn material. There are fault breccias, talus breccias, and eruptive volcanic breccias.

**Bureau Assessment Species** - Plant and animal species on List 2 of the Oregon Natural Heritage Database, or those species on the Oregon List of Sensitive Wildlife Species (OAR 635-100-040), that are identified in BLM Instruction Memo No. OR-91-57, and are not included as federal candidate, state listed or Bureau sensitive species.

**Bureau Sensitive Species** - Plant or animal species eligible for federal listed, federal candidate, state listed, or state candidate (plant) status, or on List 1 in the Oregon Natural Heritage Database, or approved for this category by the State Director.

**Candidate Species** - Those plants and animals included in Federal Register "Notices of Review" that are being considered by the U.S. Fish and Wildlife Service (USFWS) for listing as threatened or endangered. There are two categories that are of primary concern to the BLM. These are:

## Glossary

**Category 1.** Taxa for which the USFWS has substantial information on hand to support proposing the species for listing as threatened or endangered. Listing proposals are either being prepared or have been delayed by higher priority listing work.

**Category 2.** Taxa for which the USFWS has information to indicate that listing is possibly appropriate. Additional information is being collected.

**Channel Roughness** - A measure of the roughness of the surface of a channel that indicates how much resistance (friction) will be exerted on flowing water (which in turn slows the velocity of the flowing water).

**Channelization** - To straighten by means of a channel.  
**Characteristic Landscape** - The established landscape within an area being viewed. This does not necessarily mean a naturalistic character. It could refer to an agricultural setting, an urban landscape, a primarily natural environment, or a combination of these types.

**Clastic Rock** - A consolidated sedimentary rock composed of fragments broken or eroded from pre-existing rocks of any origin by chemical or mechanical weathering. Examples are conglomerate, sandstone, and siltstone.

**Concern** - A topic of management or public interest that is not well enough defined to become a planning issue, or does not involve controversy or dispute over resource management activities or land use allocations or lend itself to designating land use alternatives. A concern may be addressed in analysis, background documents, or procedures, or in a noncontroversial decision.

**Consistency** - Under the Federal Land Policy and Management Act, the adherence of BLM resource management plans to the terms, conditions, and decisions of officially approved and adopted resource related plans, or in their absence, with policies and programs of other federal agencies, state and local governments, and Indian tribes, so long as the plans are also consistent with the purposes, policies, and programs of federal laws and regulations applicable to BLM-administered lands. Under the Coastal Zone Management Act, the adherence to approved state management programs to the maximum extent practicable, of federal agency activities affecting the defined coastal zone.

**Cubic feet per second** - See cubic foot

**Cubic Foot** - Having a volume equal to a cube of one foot by one foot by one foot dimension.

**Cultural Resource** - Any definite location of past human activity identifiable through field survey, historical documentation, or oral evidence; includes archaeological or architectural sites, structures, or places, and places of traditional cultural or religious importance to specified groups whether or not represented by physical remains.

**Cultural Site** - Any location that includes prehistoric and/or historic evidence of human use or that has important sociocultural value.

**Cumulative Effect** - The impact that results from identified actions when they are added to other past, present, and reasonably foreseeable future actions regardless of who undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

**Denitrification** - The process of freeing nitrogen from its compounds or of reducing nitrates to simpler compounds (nitrites, oxides of nitrogen, ammonia) and eventually free nitrogen ( $N_2$ ). It occurs especially in waterlogged soils under anaerobic conditions through the action of denitrifying bacteria.

**Diked** - Created or modified by a man-made barrier or dike designed to obstruct the inflow of water.

**Domestic Water Supply** - Water used for human consumption.

**Easement** - A right in the owner of one parcel of land, by reason of such ownership, to use the land of another for a special purpose not inconsistent with a general property in the owner.

**Eligible River** - A river or river segment found, through interdisciplinary team and, in some cases, interagency review, to meet Wild and Scenic River Act criteria of being free-flowing and possessing one or more outstandingly remarkable values.

**Emergent Wetland** - Emergent Wetland is characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climatic conditions, Emergent Wetlands maintain the same appearance year after year.

**Endangered Species** - Any species defined through the Endangered Species Act as being in danger of extinction throughout all or a significant portion of its range and published in the Federal Register.

**Environmental Assessment (EA)** - A systematic analysis of site-specific BLM activities used to determine whether such activities have a significant effect on the quality of the human environment and whether a formal environmental impact statement is required; and to aid an agency's compliance with the National Environmental Policy Act when no EIS is necessary.

**Environmental Impact** - The positive or negative effect of any action upon a given area or resource.

**Environmental Impact Statement (EIS)** - A formal document to be filed with the Environmental Protection Agency that considers significant environmental impacts expected from implementation of a major federal action.

**Ethnographic Present** - An anthropological term meaning the present day culture of an indigenous group, such as a tribe organization of Native Americans.

**Eutrophic** - A body of water rich in nutrients, either naturally or through pollution. These bodies of water are often shallow, with seasonal deficiencies in dissolved oxygen. Algal blooms often occur seasonally.

**Fault** - A break in the earth's crust along which movement has taken place.

**Federal Candidate** - See Candidate Species

**Federally Listed** - See Endangered Species or Threatened Species.

**Federally Proposed** - See Proposed Species.

**Ferric** - Of, relating to, or containing iron.

**Historic Site** - A cultural resource resulting from activities or events dating to the historic period (generally post 1830 A.D. in western Oregon).

**Hydrology** - The properties distribution and circulation of water on the surface of the land, in the soil and underlying rocks, and in the atmosphere.

**Hypereutrophic** - A eutrophic body of water where extreme fluctuations in pH, dissolved oxygen, and ammonia occur. In addition, the algal blooms that

occur are dominated by a single species and are massive.

**Interstitial Water** - Water located in the spaces between sediment particles.

**Impact** - A spatial or temporal change in the environment caused by human activity.

**Impounded** - Created or modified by a barrier or dam which purposefully or unintentionally obstructs the outflow of water. Both man-made dams and beaver dams are included.

**Impounded Wetland** - A wetland where water is artificially controlled.

**Infiltration (soil)** - The movement of water through the soil surface into the soil.

**Intermittently Exposed** - Surface water is present throughout the year except in years of extreme drought.

**Intermittently Flooded** - The substrate is usually exposed, but surface water is present for variable periods without detectable seasonal periodicity. Weeks, months, or even years may intervene between periods of inundation. The dominant plant communities under this regime may change as soil moisture conditions change. Some areas exhibiting this regime do not fall within our definition of wetland because they do not have hydric soils or support hydrophytes.

**Irreversible or Irretrievable Commitment of Resources** - Effect of an action or inaction that cannot be reversed within a reasonable time.

**Issue** - A matter of controversy or dispute over resource management activities that is well defined or topically discrete. Addressed in the design of planning alternatives.

**Lacustrine System** - Of, relating to, formed in, or growing in lakes. According to the U.S. Fish and Wildlife Service, a Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses, or lichens with greater than 30 percent areal coverage; and (3) total area exceeds 8 ha (20 acres). Similar wetland and deep-water habitats totaling less than 8 ha are also included in the Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water

## **Glossary**

depth in the deepest part of the basin exceeds 2 meters (6.6 feet) at low water. Lacustrine waters may be tidal or nontidal, but ocean-derived salinity is always less than 0.5 mg/l. The Lacustrine System is bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine Systems formed by damming a river channel are bounded by a contour approximately the normal spillway elevation or normal pool elevation, except where Palustrine wetlands extend lakeward of that boundary. Where a river enters a lake, the extension of the Lacustrine shoreline forms the Riverine-Lacustrine boundary.

**Lake Stratification** - A thermal layering in the warm season occurs when water at various depths will not mix with other water due to differences in water density (weight) associated with temperature differences.

**Landscape Features** - The land and water form, vegetation, and structures that compose the characteristic landscape.

**Lava** - Molten rock that is extruded upon the earth's surface. Even after cooling it may be referred to as lava flows.

**Leasable Minerals** - Minerals that may be leased to private interests by the federal government. Includes oil, gas, geothermal resources, and coal.

**Litterfall** - The period of time, when a plant sheds vegetative material, prior to dormancy.

**Littoral** - All lacustrine wetland habitats that extend from the shore to a depth of 2 meters (6.6 feet) below low water.

**Locatable Minerals** - Minerals subject to exploration, development, and disposal by staking mining claims as authorized by the Mining Law of 1872 (as amended). This includes valuable deposits of gold, silver, and other uncommon minerals not subject to lease or sale.

**Macronutrient** - A chemical element of which relatively large quantities are essential to the growth and welfare of a plant.

**Management Activity** - An activity undertaken for the purpose of harvesting, traversing, transporting, protecting, changing, replenishing, or otherwise using resources.

**Management Framework Plan (MFP)** - A land use plan that established coordinated land use allocations for all resource and support activities for a specific land area

within a BLM district. It established objectives and constraints for each resource and support activity and provided data for consideration in program planning. This process has been replaced by the Resource Management Planning process.

**Micronutrient** - A chemical element of which relatively small or minute quantities are essential to the growth and welfare of a plant.

**Mineral Estate** - The ownership of the minerals at or beneath the surface of the land.

**Mitigating Measures** - Modifications of actions that (a) avoid effects by not taking a certain action or parts of an action; (b) minimize effects by limiting the degree or magnitude of the action and its implementation; (c) rectify effects by repairing, rehabilitating, or restoring the affected environment; (d) reduce or eliminate effects over time by preservation and maintenance operations during the life of the action; or (e) compensate for effects by replacing or providing substitute resources or environments.

**Monitoring/Evaluation** - The orderly collection and analysis of data to evaluate the progress and effectiveness of on-the-ground actions in meeting resource management objectives.

**Multiple Use** - Management of the public lands and their various resource values so that they are used in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; the use of some land for less than all of the resources; a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific, and historical values; and harmonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

**Neotropical Migratory Birds** - New world birds that migrate north each spring to breeding grounds in the United States and Canada, then fly south to winter in Mexico, Central America, or the Caribbean.

**Nonpoint Source Pollution** - Water pollution that does not result from a discharge at a specific, single location (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition or percolation, and normally is associated with agricultural, silvicultural and urban runoff, runoff from construction activities, etc. Such pollution results in the human-made or human-induced alteration of the chemical, physical, biological, radiological integrity of water.

**Noxious Plant** - A plant specified by law as being especially undesirable, troublesome, and difficult to control.

**Noxious Weed** - See Noxious Plant.

**Nutrient Cycling** - Circulation or exchange of elements such as nitrogen and carbon between nonliving and living portions of the environment. Includes all mineral and nutrient cycles involving mammals and vegetation.

**Nutrient Depletion** - Detrimental changes on a site in the total amount of nutrients and/or their rates of input, uptake, release, movement, transformation, or export.

**Outstandingly Remarkable Values (ORVs)** - Values among those listed in Section 1 (b) of the Wild and

Scenic Rivers Act: "scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values ..." Other similar values that may be considered include ecological, biological or botanical, paleontological, hydrological, scientific or research.

**Overland Flow** - Water flowing over the ground surface, rather than percolating into it.

**Pair Of Cattle** - One cow and calf.

**Palustrine System** - Growing in or inhabiting marshes. According to the U.S. Fish and Wildlife Service a Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 mg/l. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 meters at low water; and (4) salinity due to ocean-derived salts less than 0.5 mg/l. The Palustrine System is bounded by upland or by any of the other four Systems. The Palustrine System was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen,

and prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds. Palustrine wetlands may be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes. They may also occur as islands in lakes or rivers. The erosive forces of wind and water are of minor importance except during severe floods.

**Partly Drained** - The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes.

**Peak Flow** - The highest amount of stream or river flow occurring in a year or from a single storm event.

**Perennial Stream** - Stream that has running water on a year round basis.

**Permanently Flooded** - Water cover the land surface throughout the year in all years. Vegetation is composed of obligate hydrophytes.

**Plan Amendment** - A change in the terms, conditions, or decisions of a resource management plan.

**Plan Maintenance** - Any documented minor change that interprets, clarifies, or refines a decision within a resource management plan but does not change the scope or conditions of that decision.

**Plan Revision** - A new resource management plan prepared by following all steps required by the regulations for preparing an original resource management plan.

**Phenological** - Of or relating to periodic biological phenomena, as breeding, flowering, and migration, especially as related to climate.

**Potential ACEC** - An area of BLM-administered land that meets the relevance and importance criteria for ACEC designation, as follows:

(1) **Relevance**. There shall be present a significant historic, cultural, or scenic value; a fish or wildlife resource or other natural system or process; or natural hazard.

(2) **Importance**. The above described value, resource, system, process, or hazard shall have substantial significance and values. This generally requires qualities of more than local significance

## Glossary

**and special worth, consequence, meaning, distinctiveness, or cause for concern.** A natural hazard can be important if it is a significant threat to human life or property.

**Preferred Alternative** - That plan alternative, in the draft environmental assessment or draft environmental impact statement, which management has initially selected as offering the most acceptable resolution of the planning issues and management concerns.

**Prescribed Fire** - Introduction of fire under regulated conditions for management purposes.

**Prime Farmlands** - Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Examples of soils that qualify as prime farmland are Palouse silt loam, 0 to 7 percent slopes; Brookston silty clay loam, drained; and Tama silty clay loam, 0 to 7 percent slopes.

**Proposed Action** - Any resource use or development or management action proposed by the Bureau or to the Bureau by a member of the public or by another agency through any appropriately developed procedures including, in the case of non-Bureau proposals, nominations, petitions, and applications.

**Proposed Plan** - That plan alternative (or modification or combination of alternatives), in the final EA or final EIS, which management has selected as the Bureau's choice for selection as the plan. The State Director announces and explains the choice of the proposed plan in a signed statement near the front of the plan and environmental document. This indication does not constitute approval. (See Record of Decision.)

**Proposed Threatened or Endangered Species** - Plant or animal species proposed by the U.S. Fish & Wildlife Service to be biologically appropriate for listing as

threatened or endangered, and published in the Federal Register. It is not a final designation.

**Prospect** - To examine land for the possible occurrence of coal or valuable minerals by drilling holes, ditching, or other work.

**Refugium** - Places in a waterbody that provide food, resting places, and shelter for young fish.

**Reservoir Rock** - Any rock that contains liquid or gaseous hydrocarbons by virtue of its porosity or joint and fracture systems. Sandstones and limestones are the most commonly encountered reservoir rocks.

**Resource Management Plan (RMP)** - A land use plan prepared by the BLM under current regulations in accordance with the Federal Land Policy and Management Act.

**Right-of-Way** - A permit or an easement (document) that authorizes the use of public lands for specified purposes, such as pipelines, roads, telephone lines, electric lines, and reservoirs.

**Riparian Zone** - Those terrestrial areas where the vegetation complex and microclimate conditions are products of the combined presence and influence of perennial and/or intermittent water, associated high water tables and soils that exhibit some wetness characteristics. Normally used to refer to the zone within which plants grow rooted in the water table of these rivers, streams, lakes, ponds, reservoirs, springs, marshes, seeps, bogs, and wet meadows.

**Scenic Quality** - The relative worth of a landscape from a visual perception point of view.

**Seasonally Flooded**. Surface water is present for extended periods especially early in the growing season, but is absent by the end of the season in most years. When surface water is absent, the water table is often near the land surface.

**Sediment Yield** - The quantity of soil, rock particles, organic matter or other debris transported through a cross-section of stream in a given period of time. Measured in dry weight or by volume. Consists of suspended sediment and bedload.

**Semipermanently Flooded** - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land surface.

**Sheet Flow** - Water flowing over the ground surface in a thin layer, with no defined channel.

**Sorbents** - Substances that take up and hold other substances by adsorption or absorption.

**Source Rock** - The geological formation in which oil, gas, and/or other minerals originate.

**Special Areas** - Areas that may need special management, which may include management as an area of critical environmental concern, research natural area, outstanding natural area, environmental education area, or other special category.

**Special Recreation Management Area (SRMA)** - An area where a commitment has been to provide specific recreation activity and experience opportunities. These areas usually require a high level of recreation investment and/or management. They include recreation sites but recreation sites alone do not constitute SRMAs.

**Special Status Species** - Plant or animal species falling in any of the following categories (see separate glossary definitions for each):

- \* Threatened or Endangered Species
- \* Proposed Threatened or Endangered Species
- \* Candidate Species
- \* State Listed Species
- \* Bureau Sensitive Species
- \* Bureau Assessment Species

**Species Diversity** - The number, different kinds and relative abundance of species.

**State Implementation Plan (SIP)** - A state document, required by the Clean Air Act. It describes a comprehensive plan of action for achieving specified air quality objectives and standards for a particular locality or region within a specified time.

**State Listed Species** - Plant or animal species listed by the State of Oregon as threatened or endangered pursuant to ORS 496.004, ORS 498.026, or ORS 564.040.

**Stratification** - A structure produced by deposition of sediments in beds or layers.

**Suitable River** - A river segment found, through administrative study by an appropriate agency, to meet the criteria for designation as a component of the National Wild and Scenic Rivers system, specified in Section 4(a) of the Wild and Scenic Rivers Act.

**Surface Erosion** - The detachment and transport of soil particles by wind, water, or gravity. Surface erosion

can occur as the loss of soil in a uniform layer (sheet erosion), in many rills, or by dry ravel.

**Suspended Sediment** - Sediment suspended in a fluid by the upward components of turbulent currents or by colloidal suspension.

**Temporarily Flooded** - Surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the season. Plants that grow both in uplands and wetlands are characteristic of the temporarily flooded regime.

**Threatened Species** - Any species defined through the Endangered Species Act as likely to become endangered within the foreseeable future throughout all or a significant portion of its range and published in the Federal Register.

**Tuff** - A rock formed of compacted volcanic ash whose particles are generally finer than 4 mm in diameter.

**Unique Farmland** - Land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables.

**Viewshed** - The landscape that can be directly seen from a viewpoint or along a transportation corridor.

**Visual Resources** - The visible physical features of a landscape.

**Visual Resource Management (VRM)** - The inventory and planning actions to identify visual values and establish objectives for managing those values and the management actions to achieve visual management objectives.

**Visual Resource Management Classes** - Categories assigned to public lands based on scenic quality, sensitivity level, and distance zones. There are four classes. Each class has an objective that prescribes the amount of modification allowed in the landscape.

**Class I** - The objective is to preserve the existing character of the landscape. The level of change to the characteristic landscape should be minimal and must not attract attention. This class provides for natural ecological changes; however, it does not preclude very limited management activity.

## Glossary

**Class II** - The objective is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements or form, line, color, and texture found in the predominant natural features of the characteristic landscape.

**Class III** - The objective is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

**Class IV** - The objective is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements.

**Water Quality** - The chemical, physical, and biological characteristics of water.

**Water Yield** - The quantity of water derived from a unit area of watershed.

**Wetlands or Wetland Habitat** - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include, but are not limited to, swamps, marshes, bogs, and similar areas.

**Wet Meadows** - Areas where grasses predominate. Normally waterlogged within a few inches of the ground surface.

**Wild and Scenic River System** - A national system of rivers or river segments that have been designated by Congress and the President as part of the National Wild and Scenic Rivers System (Public Law 90-542, 1968). Each designated river is classified as one of the following:

**Wild River** - A river or section of a river free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. Designated wild as part of the National Wild and Scenic Rivers System.

**Scenic River** - A river or section of a river free of impoundments, with shorelines or watersheds still largely primitive and undeveloped but accessible in places by roads. Designated scenic as part of the National Wild and Scenic Rivers System.

**Recreational River** - A river or section of a river readily accessible by road or railroad, that may have some development along its shorelines, and that may have undergone some impoundment of diversion in the past. Designated recreational as part of the National Wild and Scenic Rivers System.

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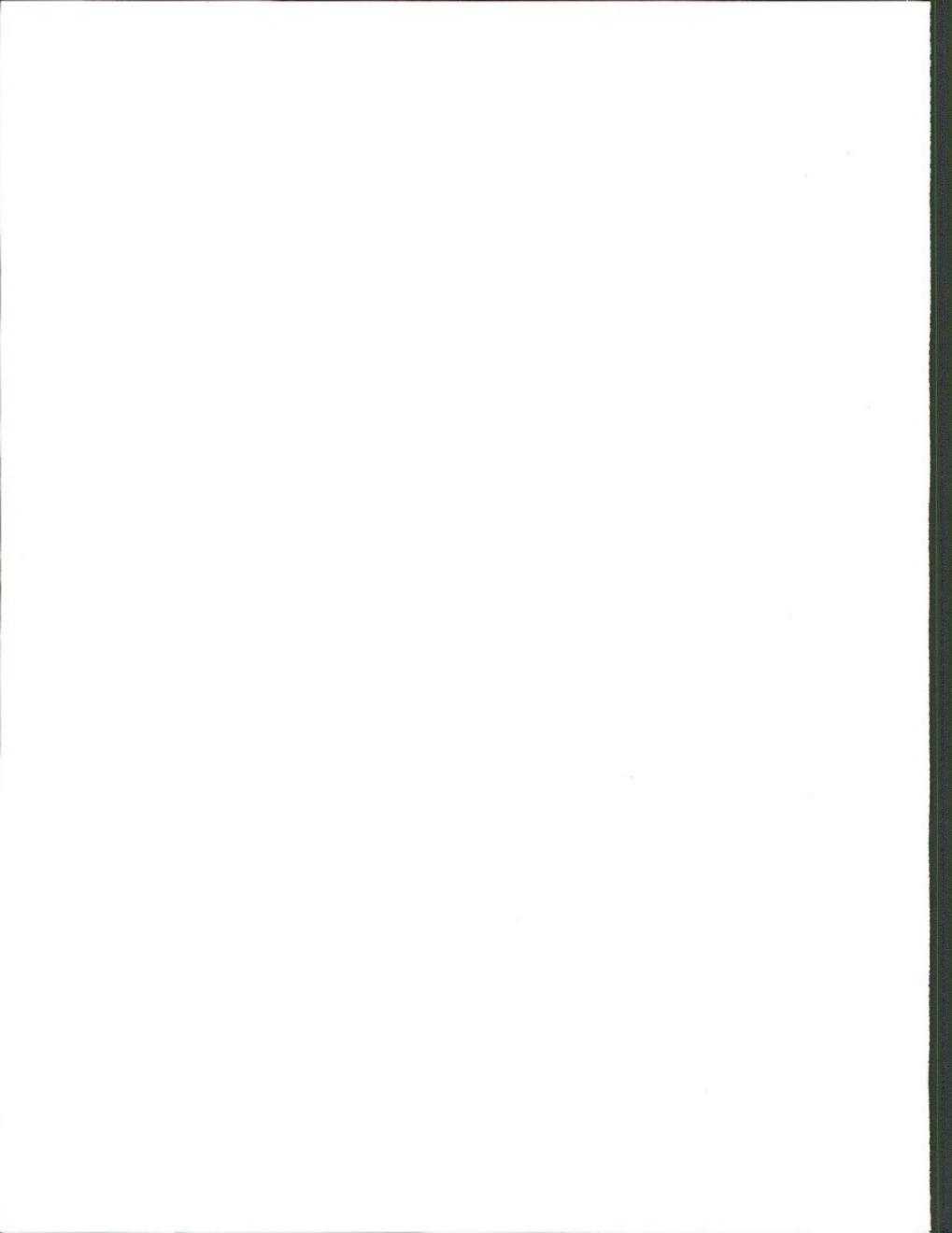
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# Index

- access ..... 1-5, 1-7, 2-2, 2-3, 2-9, 2-15, 3-4, 3-9, 3-11, 3-14, 3-16, 3-20, 3-23, 4-15, 4-18, 4-21, 4-22  
acquisition ..... 1-2, 1-4, 1-7, 2-2, 2-16, 3-23, 4-22, Apx-10, Apx-19, Apx-30  
adaptive management ..... 1-6, 3-19  
air quality ..... 2-3, 3-3, 3-7, 3-11, 3-12, 3-17, 3-23, 4-4, Apx-8  
allotment management plan ..... 3-6, 4-22  
Applegate's milkvetch ..... 2-10, 3-4, 3-9, 3-14, 3-19  
area of critical environmental concern (ACEC) ..... 3-4, 3-9, 3-16, 3-22, Apx-13  
cultural resource sites ..... 3-4, 3-11, 3-16, 3-22  
disposal ..... 1-6, 1-7, 2-16, 4-22  
dredging ..... 3-3, 3-7, 3-12, 3-18, 4-5, 4-6, 4-13, Apx-21, Apx-29, Apx-30, Apx-35, Apx-36  
easement ..... 2-3, 3-4, 3-11, 3-16, 3-22, 4-18  
exchange ..... 1-2, 1-5, 1-7, 2-16  
fishing ..... 1-5, 1-6, 2-14, 2-15, 3-4, 3-9, 3-14, 3-16, 3-20, 4-2, 4-18, 4-19, Apx-16, Apx-18  
geese ..... 2-11, 2-12, 2-15, 3-14, 4-14, 4-17, Apx-16, Apx-17, Apx-18  
hunting ..... 1-5, 1-6, 2-14, 2-15, 3-4, 3-9, 3-14, 3-16, 3-20, 4-2, 4-15, 4-18, 4-19, Apx-16, Apx-18  
Klamath Lake ..... 1-6, 2-4, 2-5, 2-6, 2-8, 2-13, 2-14, 2-15, 2-16, 3-7, 3-18, 4-7, Apx-16  
livestock grazing ..... 1-5, 2-9, 3-3, 3-6, 3-7, 3-8, 3-9, 3-11, 3-12, 3-13, 3-14, 3-16, 3-18, 3-20, 3-23,  
..... 4-2, 4-7, 4-8, 4-10, 4-11, 4-12, 4-13, 4-15, 4-16, 4-18, 4-20, 4-21, Apx-14  
marsh ..... 1-2, 2-2, 2-8, 2-12, 2-13, 2-14, 3-7, 3-12, 3-14, 3-18, 4-5, 4-13, 4-14, 4-15, 4-17  
marsh habitat ..... 3-3, 4-14, 4-15  
mineral ..... 1-5, 2-2, 2-15, 2-16, 3-6, 3-11, 3-16, 3-22, 4-2  
neotropical migrant bird ..... 3-9, 3-14, 3-20  
noxious weeds ..... 2-9, 3-6, 3-12, 3-17, 3-23, 4-10, 4-11, 4-12, 4-16  
recreation facilities ..... 1-5, 3-2, 3-4, 3-14, 3-20, 4-2, 4-7, 4-9, 4-10, 4-11, 4-12, 4-13, 4-18, 4-19, 4-20  
special status species ..... 1-5, 2-10, 2-12, 2-13, 3-3, 3-8, 3-9, 3-13, 3-14, 3-19, 4-14, 4-17, Apx-12

spotted frog .....	2-10, 2-11, 2-12, 3-14, 4-15, Apx-3, Apx-17, Apx-18
sucker .....	1-5, 1-6 2-10, 2-11, 2-13, 2-14, 3-17, 3-19, 3-23, 4-13, 4-14, 4-15, 4-17, Apx-11, Apx-16, Apx-18
tax .....	1-2, 1-5, 1-6, 1-7, 2-16, 4-22
upland habitat .....	1-2, 3-7
Watchable wildlife .....	3-9, 3-16, 3-20, 4-18, 4-19
water rights .....	1-5, 2-4, 3-17, 4-4, 4-8, Apx-9
waterfowl .....	1-6, 2-11, 2-12, 2-14, 3-14, 3-17, 3-20, 3-23, 4-14, 4-16, 4-17, Apx-17, Apx-26
wet meadow .....	2-9, 2-14, 3-3, 3-7
wildlife habitat .....	1-5, 2-9, 2-10, 2-11, 3-4, 3-9, 3-12, 3-14, 3-20, 4-13, 4-15, 4-16, 4-17, Apx-18
Wood River Marsh .....	2-2, 2-7, 2-8, 2-9, 3-3, 3-6, 3-9, 3-12, 3-14, 3-20, 4-5, 4-8, 4-11, 4-12, Apx-29
Wood River Wetland Team .....	1-4, 3-2, 3-12



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